Syllabus 2015-16

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

[Effective from Session 2013-14]

(1st Year)

[Common to all B.Tech. Branch except Agricultural Engineering]

B.Tech. First Year (Common to all B.Tech. Courses except B.Tech. Agricultural Engg.)

(Effective from the session 2013-14)

Semester-I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ NAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. **E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books **L T P 3 1 0**

Unit -1	**1st Book**	**10 Lecture**
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche)	**Chapter 1/1**	**2**
Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	**Chapter 2/1**	**6**
Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**Chapter 16/1**	**2**
Unit II	**1st Book**	**12 Lecture**
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	**Chapter 3/1**	**2**
DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier	**Chapter 4/1**	**6**
Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	**Chapter 6/1**	**4**
Unit III	**1st Book**	**6 Lecture**
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	**Chapter 10 10.1,10.4, 10.5, 10.9 1st Book**	**6**
Unit IV	**2nd Book**	**4 Lecture**
Digital Voltmeter : Introduction, RAMP Techniques **Digital Multimeters**: **Oscilloscope**: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	**5.1, 5.2 2rd Book 6.2 2nd Book 7.1,7.2,7.3, 7.4,7.5,7.20 2nd Books**	**4**
Unit V	**3rd Book**	**8 Lecture**
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	**Chapter 1, 2 3rd Book**	**8**

Text Books

1. Robert L. Boylestad &Louis Nashelsky "**Electronic Devices and Circuit Theory**" , Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "**Electronics Instrumentation**," Third Edition, TMH Publication 2012

3. George Kennedy, "**Electronic Communication System**", Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell " **Electronics Devices and Circuits**", 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "**Electronics Devices and Circuits**", 3rd Edition , TMH 2008

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202

ENGINEERING CHEMISTRY

L	T	P
3	1	0

UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^{1H}NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	**Force Systems:** • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. **Friction:** • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.	8
II	**Basic Structural Analysis:** • **Plane Truss**, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.	8
III	**Centroid and Moment of Inertia:** • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.	8
IV	**Kinematics of Rigid Body:** • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity **Kinetics of Rigid Body:** • Introduction, Force, Mass and Acceleration, Newton's law of	9

	motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum.	
V	**Mechanics of Deformable Solids:** • **Simple stress and strain**: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • **Bending of Beams**: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • **Theory of Torsion**, Torque and twist, Shear stress due to torsion circular sections.	**08**

References:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiah, University Press.
12. "Engineering Mechanics" , K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

NEE101/NEE201: ELECTRICAL ENGINEERING

L T P 3 1 0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation

Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems) 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

(Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

L	T	P
3	1	0

Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics **06 Hrs**.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II **06 Hrs.**

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III **10 Hrs.**

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV **08 Hrs.**

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NME-101/201: Basic Manufacturing Processes L T P [2 0 0]

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. **1**

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. **2**

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. **2**

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. **2**

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working **4**

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. **3**

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. **1**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **3**

Misc. Processes: Introduction to Galvanizing and Electroplating. **1**

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

NAS 105/ NAS 205 : ENVIRONMENT AND ECOLOGY

2 0 0

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.
Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Enginnering Mathematics,Volume-II,John Wiley&Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing Hous**e.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I **07 Hrs**

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II **08 Hrs**

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III **06 Hrs.**

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV **09 Hrs**

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

NME-152/NME/252 : Engineering Mechanics Lab

L T P [0 0 2]

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

NEE151/NEE251 : ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

    Between 90-100%----------Print 'A'
    80-90%----------Print 'B'
    60-80%----------Print 'C'
    Below 60%----------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

    Train No.: *integer type*
    Train name: *string*
    Departure Time: aggregate type TIME
    Arrival Time : aggregate type TIME
    Start station: string
    End station : string

    The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

    (i) List all the trains (sorted according to train number) that depart from a particular section.
    (ii) List all the trains that depart from a particular station at a particular time.
    (iii) List all he trains that depart from a particular station within the next one hour of a given time.
    (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

L T P
[0 1 3]

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

NCE-151/251 : Computer Aided Engineering Graphics

L T P

0 1 3

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

NAS-151/NAS-251: PHYSICS LAB

L T P
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

of

B. Tech. Civil Engineering
(2nd Year)

[Effective Form session 2014-15]

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NCE-302	Building Materials & Construction	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCE-303	Surveying-I	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Value & Professional Ethics/Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
7	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
8	NCE-352	Building Materials Lab	0	0	2	10	10	20	30	50	1
9	NCE-353	Surveying Lab	0	0	3	10	10	20	30	50	1
10	NCE-354	Building Planning & Drawing	0	0	2	10	10	20	30	50	1
11	NGP-301	NGP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: *Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).*

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NCE-401	Structural Analysis-I	3	1	0	30	20	50	100	150	4
3	NCE-402	Geo-informatics	3	1	0	30	20	50	100	150	4
4	NCE-403	Hydraulics & Hydraulic Machines	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NCE-404	Engineering Geology	2	1	0	15	10	25	50	75	3
	AUC-002/ AUC-001	*Cyber Security/Human Value & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
7	NCE-451	Structural Analysis Lab	0	0	3	10	10	20	30	50	1
8	NCE-452	Geo-informatics Lab	0	0	3	10	10	20	30	50	1
9	NCE-453	Hydraulics & Machine Lab	0	0	2	10	10	20	30	50	1
10	NCE-455	CBSNT Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	NGP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NME-302: MECHANICS OF SOLIDS **L T P**
3 1 0

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by.Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and & Yσungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI

7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NCE 301 FLUID MECHANICS

L T P
3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,

2. Cengel & Cimbala, ”Fluid Mechanics” TMH, New Delhi.
3. White,F.M. ”Fluid Mechanics” TMH, New Delhi.
4. Munsen et al ,”Fundamental of Fluid Mechanics” Wiley Newyork Ltd
5. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd
6. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student, Education

NCE 351 FLUID MECHANICS LAB

L T P
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NCE 302 Building Materials & Construction

L T
4 0

Unit-1

Classificationof building materials, buildingmaterialsandtheirperformance,economicsofthebuildingmaterials.

Stones, Requirement of goodbuildingstone,characteristicsof buildingstonesandtheirtesting.Commonbuildingstones.Methods of preservationofstones.

Bricks:Manufacturing processofclaybricks,classification of clay bricks.Propertiesofclaybricks,testing methods for clay bricks .Problemsofefflorescence&limeburstinginbricks&tiles.

Gypsum:propertiesofgypsumplaster,buildingproducts madeofgypsumandtheiruses.

Lime:Manufactureoflime,classificationsoflimes,propertiesoflime.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses,NaturalandArtificialflyash,Surkhi(burntclaypozzolona),ricehusk andashpozzolona,propertiesandspecificationsforuseinconstruction.

Timber:Classificationandidentificationoftimber,FundamentalEngineering Properties of timber,Defectsintimber,Factorsaffectingstrengthoftimber,Methods ofseasoningand preservationoftimber.Woodbasedproducts.

Asphalt,BitumenandTar:Terminology,specificationsanduses,Bituminous materials.

Unit– II

ChemistryofPlasticsmanufacturingprocess,classification,advantagesof plastics, Mechanical properties and use of plastic in construction.

Paint svarnishesanddistempers, Common constituents, types and desirable properties, Cement paints.

Ferrousmetals,Desirablecharacteristicsofreinforcingsteel.Principlesofcold working. Reinforcings telemechanical and physical propertieschemicalcomposition.Briefdiscussiononpropertiesandusesof Aluminumandlead.

Glass:Ingredients,propertiestypesanduseinconstruction.

InsulatingMaterials:Thermalandsoundinsulatingmaterial,desirableproperties andtypes of insulating materials.

Unit – III

Componentsofbuilding,areaconsiderations,ConstructionPrincipleandMethods forlayout,Dampproofing,antitermitetreatment in buildings,Verticalcirculationmeans :staircases and their types,designandconstruction.

Differenttypesoffloors,andflooringmaterials(Groundfloorandupperfloors). Bricksandstonemasonaryconstruction.Cavitywallhollowblockconstruction.

Unit- IV

Doors,WindowsandVentilations,Constructiondetails,types of doors and windowsand theirrelative advantages&disadvantages.Types of roofand roof treatments,LintelsandChhajja,

FunctionalefficiencyofBuildings.

Unit-V

NaturalVentilation,WaterSupplyandSanitaryfittings(Plumbing),Electricity. HeatingVentilation&Airconditioning,MechanicalLiftsandEscalators,Fire Fighting,Acoustics.

Plasteringdifferenttypes,pointing,Distempering,Colourwashing,Paintingetc. Principles&Methodsofbuildingmaintenance

References

1.SKDuggal:BuildingMaterials,NewAgeInternational
2.P.C.Varghese:BuildingMaterials,PHI

3.P.C.Varghese:BuildingConstruction,PHI
4.B.C.Funmia:ATextBookofBuildingConstruction,LuxmiPublications,Delhi.
5.O.H.Koenisberger:"Manualoftropicalhousingandbuilding"OrientLongman
6.S.P.Aroraatal.,"ATextBookofBuildingConstruction-DhanpatRai&Sons,

NCE-352 BUILDING MATERIALSLAB

LTP Testing of various properties of following as per BIS specifications
003

I.**Cement**

1.Normal Consistency of cement.
2.Initial & final setting time of cement
3.Compressive strength of cement
4.Finenessofcementbyair permeability and Le-chatalier's apparatus.
5.Soundness of cement.
6.Tensilestrength

II.**Coarse Aggregate**

1.Crushing value of aggregate
2.Impactvalue of aggregate
3.water absorption of aggregate
4.SieveAnalysis of Aggregate
5.Specific gravity &bulk density
6.Grading of aggregates.

III**FineAggregate** :

1.Sieveanalysisofsand
2.Silt content of sand
3.Bulkingofsand

IV **Cement concrete**: Workability tests, compressive strength, Tensile strength

V **Reinforcing Steel :**Tensile and yield strength, Percentage elongation

VI Non destructive testing on concrete

VII Bricks:

1.Waterabsorption.
2.Dimension Tolerances
1Compressive strength
4.Efflorescence

NCE 303 Surveying

L T
2 1

Unit - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors (**2)**

Linear Measurements, Measurement of directions: Reference meridians, bearing and azimuths, Compass, Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control, Electronic Theodolites and Total Station. **(4)**

Unit – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, Automatic level, Digital Level, Vertical Control **(4)**

Contouring: methods and uses, Principles of stadia systems, subtense bar and tangential methods **(2)**

Unit – III

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, triangulation field work **(5)**

Plane table surveying, equipments, methods, resection by three point problem **(2)**

Unit – IV

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves **(5)**

References

1. B. C. Punamia et al: Surveying Vol. I, II
2. A. M. Chandra: Plane Surveying, Higher Surveying
3. S K Duggal: Surveying Vol. I, II
4. R Subramanian : Surveying & Leveling , Oxford University Press
5. C Venkatramaih : Text Book of Surveying , University Press
6. W. Schofield, Mark Breach, Engineering Surveying
7. Charles D. Ghilani, Elementry Surveying

NCE 353 SURVEYING LAB

L T P
0 0 3

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical levelling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method

NCE-354BUILDING PLANNING & DRAWINGLAB.

LTP
003

Drafting of following Using Any CAD software

1.Symbols used in Civil Engineering drawing , Types of Masonry Bonds

*2.*Doors, Windows and staircases.

*3.*Plumbing & Electrical fitting drawings

*4.*Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation & sectional elevation) elevation, plumbing & electrical fillings in out.

*5.*Preparation of Layout plans of different types of Civil Engg. Projects.Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.

NCE-401STRUCTURALANALYSIS–I

LTP
310

Unit–I :

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom per node, Static and Kinematic Indeterminacy for beams, trusses and building frames.[03]
Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.[05]

Unit– II

Rolling loads and influence line diagrams for beams and trusses, Absolute maximum bending moment and shear force.
Muller-Breslau's principal & its applications for determinate structures[08]

Unit – III

Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged parabolic arch, spandrel
braced arch, moving load & influence lines for three hinged arch.[08]

Unit – IV

Strain Energy of deformable systems, Maxwell's reciprocal &Betti's theorem, Castigliano's first theorem, Calculations of deflections: Moment area method, unit load method& Conjugate beam methods for statically determinate beams ,truss and frames.[08]

Unit–V

Unsymmetrical bending in beams, location of neutral axis, computation of stresses and deflection,
Shear Centre its location for common structural sections.[05]
Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.[03]

References

1.Hibbler ," Structural Analysis ", Pearson Education
2.T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
*4.*Reddy,C.S., "Basic Structural Analysis", Tata McGraw Hill.

*5.*Jain,O.P.and Jain, B.K., "Theory & Analysisof Structures ". Vol.I & II Nem Chand.
*6.*Vazirani&Ratwani et al ," Analysis of Strcuctures " , Khanna Publishers
*7.*Coates,R.C.,Coutie,M.G. & Kong, F.K., "Structural Analysis", English Language BookSociety & Nelson, 1980.

NCE-451STRUCTURALANALYSISLAB

LTP
003 Following experiments to be performed

1.To determine Flexural Rigidity (EI) of a given beam
2.To verify Maxwell's Reciprocal theorem.
3.To find horizontal thrust in a three-hinged arch and to draw influence line diagramsfor Horizontal Thrust end Bending moment.
4.To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5.To find deflection of curved members.
6.To find bar forces in a three members structural frames with pin jointed bar
7.To find Critical load in Struts with different end conditions.
8.To find deflections in Beam having unsymmetrical bending.

NCE 402 GEOINFORMATICS

L T P
3 1 0

Unit - I
Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation, Introduction to Digital Photogrammetry.

Unit - II
Remote Sensing: Physics of remote sensing, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC

Unit - III
Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing

Unit - IV
Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications

Unit - V
Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Higher Surveying
3. T M Lillesand et al: Remote Sensing & Image Interpretation
4. B. Bhatta: Remote Sensing & GIS
5. M Anjireddy : Remote Sensing & GIS , BS Publications
6. A. E Rabbany: Introduction to GPS
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad.

NCE 452 GEOINFORMATICS LAB

L T P
0 0 3

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

NCE 403 Hydraulics & Hydraulic Machines

L T P
3 1 0

Unit - I

Difference between open channel flow and pipe flow, geometrical parameters of a channel.

Continuity equation for steady and unsteady flow.

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit – II

Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.

Unit - III

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.

Unit - IV

Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds.

Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.

Unit - V

Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References :

1.Chow,V.T."Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

NCE 453 Hydraulics & Hydraulic Machines LAB

L T P
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc

NCE 454 COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

L	T	P
0	0	3

Write Programs in 'C' Language:

1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-
falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular
form for each of these methods.
2. To implement Newton's Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation
formula
4. To implement Numerical Differentiations & Integration
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness
7. Linear correlation and regression

NCE-404 Engineering Geology

L T P
2 1 0

UNIT I – Study of Rocks:

Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties. **10**

UNIT I I- Study of Minerals:

Physical properties of minerals. Detailed study of certain rock forming minerals. Alkali aggregate reaction. Grouting. Pozzolonic materials. **10**

UNIT III- Rock Deformation & Earthquake

Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration. **10**

UNIT IV- Geophysical Exploration and Geological Investigation:

Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway. **10**

References:

1. D Venkat Reddy: Engg. Geology, Vikas Publication
2. Tony Waltham: Foundations of Engg. Geology, Spon Press
3. Tony Waltham: Foundations of Engineering Geology, SPON Press.
4. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
5. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
6. K V G K Gokhale: Text book of Engineering Geology, B S Publication.
7. Prabin Singh: Engg. and General Geology, Katson Publishing House.
8. D S Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
9. F G Bell: Fundamental of Engineering Geology, B S Publication.
10. Leggot R F: Geology and Engineering, McGraw Hill, New York.
11. P K Mukerjee: A Text book of Geology, Calcuta Word Publishers.
12. B S Sathya Narayanswami: Engineering Geology, Dhanpat Rai & Co.
13. Prakash Rao : Engineering Geology, Nirali Prakashan, Pune.

U. P. TECHNICAL UNIVERSITY,
IET CAMPUS, SITAPUR ROAD, LUCKNOW- 226 021

COURSE STRUCTURE AND SYLLABUS
(EFFECTIVE FROM Session: 2015-16)

B.Tech. (Civil Engineering)

Third Year (5th & 6th Semester)

JULY 10, 2015

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 5th Semester

S.No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
2	NCE 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	NCE 502	Transportation Engineering-1	3	1	0	30	20	50	100	150	4
4	NCE 503	Environmental Engineering-1	2	1	0	15	10	25	50	75	3
5	NCE 504	Structural Analysis-2	3	1	0	30	20	50	100	150	4
6	NCE 505	Design of Concrete Structure-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	NCE 551	Geotechnical Engineering Lab	-	-	3	10	10	20	30	50	1
8	NCE 552	Transportation Engineering Lab	-	-	3	10	10	20	30	50	1
9	NCE 553	CAD Lab-1	-	-	3	10	10	20	30	50	1
10	NCE 554	Estimation Costing & Valuation			3	10	10	20	30	50	1
11	NGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		TOTAL	16	5	12					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 6th Semester

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
2	NCE 601	Design of Concrete Structure-2	3	1	0	30	20	50	100	150	4
3	NCE 602	Environmental Engineering-2	3	1	0	30	20	50	100	150	4
4	NCE 603	Construction Technology & Management	3	1	0	30	20	50	100	150	4
5	NCE 011 -014	Departmental Elective-1	3	1	0	30	20	50	100	150	4
6	NCE 021-024	Departmental Elective-2	2	1	0	15	10	25	50	75	3
PRACTICAL/DRAWING/DESIGN											
7	NCE 651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
8	NCE 652	Environmental Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCE 653	CAD Lab-2	0	0	3	10	10	20	30	50	1
10	NCE 654	Survey Camp*	0	0	0	0	0	50		50	1
11	NGP 601	General Proficiency	0	0	0	0	0	50	-	50	
		TOTAL	16	5	9					1000	25

Note:*The teaching load of survey camp will be counted as equivalent to 0-0-3.

Departmental Elective -1 (Full Unit Course with Credit: 4)

Sl.No.	Code and Course
5 (A)	NCE 011 – Advanced Foundation Design
5 (B)	NCE 012 – Matrix Analysis of Structures
5 (C)	NCE 013 – Environmental Management for Industries
5 (D)	NCE 014 – Principals of Town Planning and Architecture

Departmental Elective – 2 (Half Unit Course with Credit: 3)

Sl.No.	Code and Course
6 (A)	NCE 021 – Advanced Concrete Design
6 (B)	NCE 022 – Earth and Earth Retaining Structure
6 (C)	NCE 023 – Transportation System and Planning
6 (D)	NCE 024 – Rural Water supply and Sanitation

5.2 NCE – 501: GEOTECHNICAL ENGINEERING

L– 3, T– 1, P- 0
CT–30, TA–20, ESE -100

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton' s pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and c-φ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies.
Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & References Books

1. **V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)**
2. **K.R. Arora – Soil Mechanics and Foundation Engineering**
3. **Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.**
4. **Alam Singh – Modern Geotechnical Engineering**
5. **Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning**
6. **I.H. Khan – Text Book of Geotechnical Engineering**
7. **C. Venkataramaiah – Geotechnical Engineering**
8. **Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics**
9. **G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics**
10. **P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.**
11. **Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering**
12. **Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.**

5.3 NCE – 502: TRANSPORTATION ENGINEERING-I

L-3, T-1, P-0

CT-30, TA-20, ESE-100

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR)

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications,

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Book:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.**
2. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**

References:

3. **Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi – 110 006**
4. **Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi**
5. **Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.**
6. **Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.**
7. **Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,**
8. **IRC : 37-2012, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi**

9. IRC: SP:68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
10. IRC: 58-2011, "Guidelines for The design of Plain Jointed Rigid Pavements for Highways", Indian Roads Congress, New Delhi.
11. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
12. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

5.4 NCE – 503 ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1, P -0
CT – 15, TA – 10, ESE – 50

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.
Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.
Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.
Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient

air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books:

1. **Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**
2. **Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.**
3. **Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).**
5. **Seinfeld, J.H. and Pandis, S.N. "Atmospheric Chemistry and Physics: From Air Pollution to Climate Change", John Wiley**
6. **http://cpcb.nic.in/, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.**

References:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
2. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
3. **Steel and McGhee: Water Supply and Sewerage**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Hammer and Hammer Jr.: Water and Wastewater Technology**
6. **Raju: Water Supply and Wastewater Engineering**
7. **Rao: Textbook of Environmental Engineering**
8. **Davis and Cornwell: Introduction to Environmental Engineering**
9. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
10. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
11. **Birdie: Water Supply and Sanitary Engineering**
12. **Ramalho: Introduction to Wastewater Treatment Processes**
13. **Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**

5.5 NCE - 504: STRUCTURAL ANALYSIS-2

L-3, T -1, P-0

CT– 30, TA– 20, ESE- 100

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **Jain, A. K.,"Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.**
2. **Hibbeler, R.C.,"Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309**
3. **C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.**
4. **Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem**
5. **Chand & Bros., Roorkee.**
6. **Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.**
7. **Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.**

8. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
9. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
10. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi..

5.6 NCE - 505: DESIGN OF CONCRETE STRUCTURE-1

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly
Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.
2. The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **IS: 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
4. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
5. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
6. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
7. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**
8. **Sinha, S.N., "Reinforced Concrete Design" Mc-Graw Hill Book Publishing Company Ltd., New Delhi**
9. **Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press,New Delhi – 110 001.**

5.7 NCE – 551: GEOTECHNICAL ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. **Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.**
2. **Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.**
3. **Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.**
4. **Determination of relative density of a given soil sample.**
5. **Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.**
6. **Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).**
7. **Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).**
8. **Determination of compaction characteristics (OMC & MDD) of a given soil sample.**
9. **Determination of permeability of a remolded soil sample by constant head &/or falling head method.**
10. **Determination of consolidation characteristics of a remolded soil sample by an oedometer test.**
11. **Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.**

12. **Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.**

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. **Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.**

5.8NCE – 551: TRANSPORTATION ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

LIST OF EXPERIMENTS

1. **To Determine the Crushing Value of Coarse Aggregates.**
2. **To Determine the Impact Value of Coarse Aggregates.**
3. **To determine the Flakiness Index and Elongation Index of Coarse Aggregates.**
4. **To determine the Los Angeles Abrasion Value of Coarse Aggregates.**
5. **To determine the Stripping Value of Coarse Aggregates.**
6. **To determine the penetration Value of Bitumen.**
7. **To determine the Softening Point of Bituminous material.**
8. **To determine the Ductility Value of Bituminous material.**
9. **To determine the Flash and Fire Point of Bituminous material.**
10. **To determine the Stripping Value of Bituminous material.**
11. **Classified both directional Traffic Volume Study.**
12. **Traffic Speed Study. (Using Radar Speedometer or Enoscope).**
13. **Determination of CBR Value of soil sample in the Lab or in Field.**

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**
2. **Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.**

3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

5.9 NCE - 553: CAD LAB I

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

5.10 NCE - 553: ESTIMATION COSTING & VALUATION

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., "Estimation and Costing in Civil Engineering (Theory and Practice)", UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, "A Text book of Estimation Costing and Valuation" Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., "Estimating Construction Costs" Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

6.2 NCE- 601 DESIGN OF CONCRETE STRUCTURE II

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References

1. **IS : 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete : Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Dayaratnam, P, "Limit State Design of Reinforced Concrete Structures" Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.**
4. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
5. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
6. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
7. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
8. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**

6.3 NCE-602: ENVIRONMENTAL ENGINEERING – 2

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets.

Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc.

Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Other emerging technologies for wastewater treatment: Duckweed pond,

vermiculture, root zone technologies, sequential batch reactor (SBR) etc. Solid waste Management: Definition of solid waste and its classification, Hazardous waste, Prevailing regulations of solid waste management in India. Noise Pollution: Definition, Sources, Prevailing noise standards in India.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

Text books:

1. **Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.**
2. **Metcalf and Eddy Inc.: Wastewater Engineering**
3. **Garg: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).**
5. **Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.**

Reference books:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban**
2. **Development, Government of India, New Delhi**
3. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Arceivala: Wastewater Treatment for Pollution Control**
6. **Hammer and Hammer Jr.: Water and Wastewater Technology**
7. **Raju: Water Supply and Wastewater Engineering**
8. **Sincero and Sincero: Environmental Engineering: A Design Approach**
9. **Pandey and Carney: Environmental Engineering**
10. **Rao: Textbook of Environmental Engineering**
11. **Davis and Cornwell: Introduction to Environmental Engineering**
12. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
13. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
14. **Birdie: Water Supply and Sanitary Engineering**
15. **Ramalho: Introduction to Wastewater Treatment Processes**
16. **Parker: Wastewater Systems Engineering**

6.4 NCE-603: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owing and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira " Construction Planning Equipment and Methods" McGraw Hills Education (India), Private Ltd.,New Delhi.**
2. **Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.**
3. **Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad – 500 004**
4. **Construction Management by Ojha**
5. **Srivastava, U.K.,"Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.**
6. **Construction Technology By Sarkar, Oxford.**

DEPARTMENTAL ELECTIVE – 1 SUBJECT (NCE-011 to NCE-014)

6.5 (A) NCE-011: ADVANCED FOUNDATION DESIGN

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit -1

Modern methods of soil investigations ,Geophysical methods; soil resistivity methods seismic refraction method ,stress below ground due to loads

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmertman's methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour,

Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads ,Machine foundation: classification, definitions, design principle in brief, Barken's method.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & Reference Books:

1. **K. R. Arora – Soil Mechanics & Foundation Engineering.**
2. **Alam Singh – Modern Geotechnical Engineering.**
3. **Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics**
4. **J. E. bowles – Analysis and Design of Foundation.**
5. **V. N. S. Murthy – Soil Mechanics and Foundation Engineering.**
6. **B. M. Das – Foundation Engineering, CENGAGE Learning**

6.5 (B) NCE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE - 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2
Hand computation of problems on trusses, frames and grids.

UNIT – 3
Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Reference:

1. **Weaver & Gere, Matrix Analysis of Framed structures.**
2. **H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill New York**
3. **Pandit, G.S.," Structural Analysis: A Matrix Approach" McGraw Hill Education (India) Pvt. Ltd., Noida.**

6.5(C) NCE – 013: ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw

materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC):Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ.

References:

1. **EIA Manuals of MOEF (Available on http://envfor.nic.in/essential-links/eia-specific-manuals and http://envfor.nic.in/division/introduction-8)**
2. **Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website**
3. **Environmental Impact Assessment-Training resource manual, UNEP 2001**
4. **Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,**
5. **George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.**
6. **Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.**
7. **Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.**
8. **Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi**

6.5 (D) NCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit - 1

Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic arid social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.

Unit - 2

An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.

Unit -3

Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.

Unit - 4

Elements of Architectural Design: Line. Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.

Unit - 5

Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
4. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
5. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
6. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
7. Nelson P. Lewis, Planning to Modern City, Routledge.
8. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
11. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
12. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
13. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi
14. National Building Code of India, latest edition

DEPARTMENTAL ELECTIVE –2 SUBJECT (NCE-021 to NCE-024) (Half Unit Course)

6.6 (A) NCE-021: ADVANCED CONCRETE DESIGN

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit - 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.

Unit - 2

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

Unit - 3

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under-concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab and R.C. T-beam types.

Unit - 4

High performance concrete, Production and no -conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Reinforced Concrete Design by M L Gambhir**
2. **Reinforced Concrete Design by B C Punamia**
3. **Essentials of Bridge Engineering by D.J. Victor**

6.6 (B) NCE- 022: EARTH AND EARTH RETAINING STRUCTURE

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis. Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability

Unit -2

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit - 3

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface-friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -4

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **V N S Murthy - Soil Mechanics and Foundation Engg**
2. **Swami Saran - Reinforced Soil and its Engineering Application**
3. **J. E. Bowles - Analysis and Design of Foundation.**
4. **B. M. Das - Foundation Engineering , CENGAGE Learning**
5. **P.C Varghese- Foundation Engineering, PHI Learning Pvt. Ltd., Delhi**
6. **N.N.SOM, S.C.Das, Theory and Practice of Foundation Design, PHI Learning Pvt. Ltd., Delhi**

6.6 (C) NCE-023: TRANSPORTATION SYSTEM AND PLANNING

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Goals and objective of Transportation planning,

UNIT-2-

Type of transportation system: Different modes of surface transport, Public Transport Intermediate Public Transport (IPT), Rapid and mass transport system like MRTS & bus rapid transit. Traffic Flow and traffic stream theory & variables, Queing theory.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Introduction to Transportation Engineering: William W. Hay.**
2. **Introduction to Transportation Engineering planning- E.K.Mortak.**
3. **Metropolitan Transportation planning-J.W.Dickey.**
4. **Traffic Engineering, L.R. Kadiyali**
5. **Banks, James H., "Introduction to Transportation Engineering", McGraw Education (India), Pvt. Ltd., Noida.**

6.6 (D) NCE-024: RURAL WATER SUPPLY AND SANITATION

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.
Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.**
2. **Operation and maintenance of rural water supply and sanitation systems by Brikké F**
3. **'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.,**
4. **WHO 'Water Supply and Sewerage', by E.W.Steel & T.J.Mcghee, McGraw Hill.**
5. **'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.**

6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

6.7 NCE- 651: STRUCTURAL DETAILING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt. Ltd., Hyderabad.

6.8 NCE-652: ENVIRONMENTAL ENGINEERING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM_{10} with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

Note: Any 8 Experiments out of the list of experiments are to be performed.

References:

1. **A.P.H.A. "Standard Methods for the Examination of Water and Wastewater", American Public Health Association.**
2. **Sawyer, C.N., McCarty, P.L. & Parkin, G.F. "Chemistry for Environmental Engineering", Mc-Graw Hill.**
3. **Mathur, R.P. "Water & Wastewater Testing", Lab Manual, Roorkee.**

6.9 NCE-653: CAD LAB II

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. **Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)**
2. **Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.**
3. **Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)**
4. **Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)**

6.10NCE-654: SURVEY CAMP

TOTAL MARKS: 50

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map.

The course will be run in the form of a camp for 7 working days and will involve the following components:

1. **Reconnaissance of the area to be mapped.**
2. **Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.**
3. **Detail digital mapping using Total station/GPS.**
4. **Preparing a digital map using open source mapping software and report writing.**

Note: Teaching load will be equivalent to 0-0-3.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

OPEN ELECTIVE-I

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

OPEN ELECTIVE-II

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (*λ*), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial

processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI

6. French, R.H., Open channel Hydraulics, McGraw Hill International

7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of

power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford & Haddow's analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. **2**

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. **8**

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme

technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

[Effective from Session 2013-14]

(1st Year)

[Common to all B.Tech. Branch except Agricultural Engineering]

B.Tech. First Year (Common to all B.Tech. Courses except B.Tech. Agricultural Engg.)

(Effective from the session 2013-14)

Semester-I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ NAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. **E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books **L T P 3 1 0**

Unit -1	**1st Book**	**10 Lecture**
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche)	**Chapter 1/1**	**2**
Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	**Chapter 2/1**	**6**
Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**Chapter 16/1**	**2**
Unit II	**1st Book**	**12 Lecture**
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	**Chapter 3/1**	**2**
DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier	**Chapter 4/1**	**6**
Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	**Chapter 6/1**	**4**
Unit III	**1st Book**	**6 Lecture**
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	**Chapter 10 10.1,10.4, 10.5, 10.9 1st Book**	**6**
Unit IV	**2nd Book**	**4 Lecture**
Digital Voltmeter : Introduction, RAMP Techniques **Digital Multimeters**: **Oscilloscope**: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	**5.1, 5.2 2rd Book 6.2 2nd Book 7.1,7.2,7.3, 7.4,7.5,7.20 2nd Books**	**4**
Unit V	**3rd Book**	**8 Lecture**
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	**Chapter 1, 2 3rd Book**	**8**

Text Books

1. Robert L. Boylestad &Louis Nashelsky "**Electronic Devices and Circuit Theory**" , Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "**Electronics Instrumentation**," Third Edition, TMH Publication 2012

3. George Kennedy, "**Electronic Communication System**", Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell " **Electronics Devices and Circuits**", 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "**Electronics Devices and Circuits**", 3rd Edition , TMH 2008

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202

ENGINEERING CHEMISTRY

L	T	P
3	1	0

UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^{1H}NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	**Force Systems:** • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. **Friction:** • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.	8
II	**Basic Structural Analysis:** • **Plane Truss**, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.	8
III	**Centroid and Moment of Inertia:** • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.	8
IV	**Kinematics of Rigid Body:** • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity **Kinetics of Rigid Body:** • Introduction, Force, Mass and Acceleration, Newton's law of	9

	motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum.	
V	**Mechanics of Deformable Solids:** • **Simple stress and strain**: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • **Bending of Beams**: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • **Theory of Torsion**, Torque and twist, Shear stress due to torsion circular sections.	**08**

References:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiah, University Press.
12. "Engineering Mechanics" , K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

NEE101/NEE201: ELECTRICAL ENGINEERING

L T P 3 1 0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation

Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems) 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

(Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

L	T	P
3	1	0

Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics **06 Hrs**.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II **06 Hrs.**

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III **10 Hrs.**

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV **08 Hrs.**

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NME-101/201: Basic Manufacturing Processes L T P [2 0 0]

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. **1**

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. **2**

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. **2**

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. **2**

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working **4**

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. **3**

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. **1**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **3**

Misc. Processes: Introduction to Galvanizing and Electroplating. **1**

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

NAS 105/ NAS 205 : ENVIRONMENT AND ECOLOGY

2 0 0

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.
Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Enginnering Mathematics,Volume-II,John Wiley&Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing Hous**e.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I **07 Hrs**

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II **08 Hrs**

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III **06 Hrs.**

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV **09 Hrs**

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

NME-152/NME/252 : Engineering Mechanics Lab

L T P [0 0 2]

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

NEE151/NEE251 : ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

    Between 90-100%----------Print 'A'
    80-90%----------Print 'B'
    60-80%----------Print 'C'
    Below 60%----------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

    Train No.: *integer type*
    Train name: *string*
    Departure Time: aggregate type TIME
    Arrival Time : aggregate type TIME
    Start station: string
    End station : string

    The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

    (i) List all the trains (sorted according to train number) that depart from a particular section.
    (ii) List all the trains that depart from a particular station at a particular time.
    (iii) List all he trains that depart from a particular station within the next one hour of a given time.
    (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

L T P
[0 1 3]

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

NCE-151/251 : Computer Aided Engineering Graphics

L T P

0 1 3

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

NAS-151/NAS-251: PHYSICS LAB

L T P
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

for

B.TECH. COMPUTER SCIENCE AND ENGINEERING

of

Second Year

(Effective from the Session: 2014-15)

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-409	Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NCS-403	Computer Graphics	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC-459	Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NCS 453	Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I

Digital Design and Binary Numbers:

Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.

Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).

Unit-II

Combinational Logic:

Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic

Unit-III

Memory and Programmable Logic Devices:

Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.

Unit-IV

Synchronous Sequential Logic:

Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.

Unit-V

Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT)

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .

Unit – II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit – III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit – IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.
8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.
10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**

  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability

  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**

  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series

  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**

  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation

  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**

  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence

  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method

  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

  Recommended Books:

  - *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
  - *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
  - *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. * Douglas V. Hall, "Microprocessors and Interfacing", , Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.
4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, "IBM PC Assembly language and programming", Fifh Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :

1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Unit – III
Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit – IV
Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7.Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
8. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1.To implement CPU Scheduling Algorithms
- FCFS
- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms
- FIFO
- LRU

3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Engineering
&
Bachelor of Computer Science & Information Technology

3rd Year (V & VI Semester)

(Effective from Session: 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

&

B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session: 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NCS 505	Computer Architecture	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

&

B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NCS 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NCS 061: Computational Geometry
2. NCS 062: Complexity Theory
3. NCS 063: Parallel Algorithm
4. NCS 064: Approximation & Randomized Algorithm
5. NCS 065: Concurrent System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 067: Distributed Database
3. NCS 068: E-Commerce
4. NCS 069: Advance DBMS
5. NCS 070: Human Computer Interface

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures***:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date C J, " An Introduction to Database Systems", Addision Wesley

3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications 3. Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NCS- 505 Computer Architecture		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction**:. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Central Processing Unit:** Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.	8
II	**Control Unit:** Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	8
III	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues 9 performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8
IV	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:-

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. Vravice,Hamacher & Zaky, “Computer Organization”, TMH
3. Mano,” Computer System Architecture”, PHI
4. John P Hays, “ Computer Organization”, McGraw Hill
5. Tannenbaum,” Structured Computer Organization’, PHI 6.
P Pal chaudhry, ‘ Computer Organization & Design’, PHI

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return x^2 -y^2 , otherwise y^2 - x^2)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8

Textbooks:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley

5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003.
3.Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

NCS-061 Computational Geometry		3 1 0
Unit	Topic	Proposed Lectures
I	Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.	8
II	Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties	8
III	Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems	8
IV	Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham- sandwich cuts.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

NCS-062 Complexity Theory		3 1 0
Unit	Topic	Proposed Lectures
I	Models of Computation, resources (time and space), algorithms, computability, complexity.	8
II	Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.	8
III	Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.	8
IV	Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.	8
V	Probabilistically checkable proofs; Communication complexity; Quantum computation	8

Textbooks:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

NCS-063 Parallel Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.	8
II	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.	8
III	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.	8
IV	Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.	8
V	Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.	8

Textbooks:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill. 2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

NCS-064 Approximation and Randomized Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to probability and randomized algorithms. Examples of randomized algorithms . Basic inequalities, Random variables.	8
II	Max-cut and derandomization. Permutation routing in a hypercube. Basic Chernoff bound. Markov chains and random walks (2-SAT example, random walk on a path example). Cover times. Universal traversal sequences.	8
III	Generation of combinatorial arrays. Random constructions and derandomized algorithms.	8
IV	Introduction to Approximation Algorithms, Set cover, TSP ,Knapsack, bin packing, Euclidean TSP	8
V	LP duality introduction; set cover randomized rounding, Set cover via primal - dual , k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees	8

References:

1. Rajeev Motwani and Prabhakar Raghavan. Randomized Algorithms. Cambridge University Press, Cambridge, England, June 1995.
2. Michael Mitzenmacher and Eli Upfal. Probability and Computing. Cambridge University Press, 1st edition, 2005.
3. Sheldon M. Ross. Probability Models. Academic Press, Inc., 7th edition, 2000 4. V. Vazirani, Approximation Algorithms, Springer, 2001.

NCS-065 Concurrent Systems		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction to concurrent systems and Formal Methods:** Reactive systems, Formal methods for reactive systems, Labelled transition systems, Operational semantics for concurrent processes.	8
II	**Process Algebras**: Operators for process modelling, CCS, CSP, Pi-calculus	8
III	Asynchronous Pi Calculus	8
IV	Distributed Pi Calculus, Introduction to type systems	8
V	**Tools and Techniques:** Experimental practice on mobility workbench (MBW), concurrency workbench (CWB-NC), CTMC.	8

References:

1. Robin Milner: Communicating and mobile systems: The π-Calculus,Cambridge University Press, 1999
2. Matthew Hennessy: A distributed Pi-Calculus, Cambridge University Press, 2007
3. Davide Sangiorgi and David Walker: The π -Calculus: A theory of Mobile Processes, Cambridge , University Press, 2001
4. Manuals of MBW, CWB-NC,CTMC.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

Textbooks:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

TextBooks:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education .

Refrences:

1.Ceei and Pelagatti,'Distributed Database', TMH

2.Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-068 E-Commerce		2 1 0
Unit	Topic	Proposed Lectures
I	Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.	8
II	Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
IV	Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.	8
V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	8

Text Books:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison-Wesley.
2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International 3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

NCS-069 Advanced DBMS		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler	8
III	Distributed Transactions Management, Data Distribution,fragmentation and Replication Techniques,Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques	8

Text Books:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

References:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education 2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Dr.A.P.J.Abdulkalam Technical University, UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR forth, SEMESTER –VII
(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NCS-701	Distributed System	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NCS-751	Distributed System *	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdul kalam Technical University,UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR forth, SEMESTER –VIII
(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NCS-801	Digital Image Processing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practical's / Training /Projects									
5	NCS-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

Open Elective I

1. NOE-071 Entrepreneurship Development
2. NOE-072 Quality Management
3. NOE-073 Operations Research
4. NOE-074 Introduction to Bio Technology
5. NOE-075 Mobile Application Development
6. NOE-076 Ethical Hacking and Prevention
7. NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NCS-073 Computer Vision

Departmental Elective IV

1. NCS-07 4 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NIT-701 Cryptographic & Network Security

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-081 High Performance Computing
3. NCS-082 Real Time System
4. NCS-083 Cluster Computing
5. NCS-084 Grid Computing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-086 Quantum Computing
3. NCS-087 Embedded Systems
4. NCS-088 Semantic Web and Web Services

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5

Government policy for small scale industry; stages in starting a small scale industry. 2

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9

U NIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5

Role of various national and state agencies which render assistance to small scale industries. 2

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I

Quality Concepts:

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. 5

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. 2

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. 8

UNIT –V

ISO-9000 and its concept of Quality Management

7

ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.

Linear Programming:

Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathematical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queuing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P

3 1 0

UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:
1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077 L T P
3 1
0

UNIT-I:
Introduction and Software Project Planning5

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:
Project Organization and Scheduling 10
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
Project Monitoring and Control10
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:
Project Management and Project Management Tools10
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:
1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

DISTRIBUTED SYSTEMS

NCS-701 **L T P**
3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks.
Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.
Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System

model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

REFERENCES:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

ARTIFICIAL INTELLIGENCE

NCS-702 **L T P**

3 1 0

Unit-I **10**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **10**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **10**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **10**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V **5**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering: **10**
Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.
Verification:
Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II
Functional Testing: **10**
Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.
Structural Testing:
Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, CyclomaticComplexity, Data Flow Testing, Mutation Testing.

Unit-III
Regression Testing:: **10**
What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.
Reducing the number of test cases:
Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV: **10**
Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing
Automated Test Data Generation:
Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V: **5**
Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.
Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

REFERENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010,Springer
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011 Springer
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998 Prentice Hall
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High SpeedLAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiandWiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.

REFERENCES:

1. William Stallings, "High speed networks and internet", Second Edition, PearsonEducation, 2002
2. Warland, PravinVaraiya, "High performance communication networks", SecondEdition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", CiscoPress, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band TelecommunicationNetworks", CRC Press, New York, 2004

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I **8**

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II **12**

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III 8

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV 8

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V8

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

REFERENCES:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076	**L**	**T**	**P**
	3	**1**	**0**

UNIT I **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration
Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

REFERENCES:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”,Pearson Education, 2005.
2. Newcomer, Lomow“ Understanding SOA with Web Services”, Pearson Education, 2005.
3. SandeepChatterjee, James Webber, “Developing Enterprise Web Services, AnArchitect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern,“ Enterprise SOA Designing IT for BusinessInnovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.
Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,
Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)
Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Authentication Applications:
Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.
Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

DISTRIBUTED SYSTEM LAB

NCS-751	**L**	**T**	**P**
	0	**0**	**2**

The following programs may be developed preferably on 'UNIX' platform:-A part from the above other problems may be given as per Course Instructor.

1. Simulate the functioning of Lamport's Logical Clock in 'C'.
2. Simulate the Distributed Mutual Exclusion in 'C'.
3. Implement a Distributed Chat Server using TCP Sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'
5. Implement 'Java RMI' mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in 'C'.
7. Implement CORBA mechanism by using 'C++' program at one end and 'Java program on the other.

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 **L T P**
3 1 0

UNIT-I
Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4
UNIT-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9
UNIT-III Geothermal
Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations. 2
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations. 3
UNIT-IV
Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations. 2
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6
UNIT-V
Bio-mass:
Availability of bio-mass and its conversion theory. 2
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants. 3
Text/References Books:
1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International. 5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 **L T P**
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. 8
UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7
UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. 8
UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8
UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9
Reference Books:
1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 **L T P**
3 1 0

UNIT-1
Concept of Product, definition and scope.
Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.
UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
UNIT –III
Transformations, Brainstorming& Synetics, Morephological techniques.
Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.
Economic aspects, Fixed and variable costs, Break-even analysis.
UNIT-IV
Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.
UNIT-V
Existing techniques, such as work-study, SQC etc. for improving method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.
Text/Reference Books:
3. A.K. Chitab& R.C. Gupta "Product design & Manufacturing" – Prentice Hall (EE)
4. R.P. Crewford, "The Technology of creation Thinking" Prentice Hall.
5. C.D. Cain, "Product Design & Decision" Bussiness Books.
7. C.D. Cain, "Engg. Product Design" Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 **L T P**
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.
Text/Reference Books:
1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automat

Digital Image Processing

NCS-801 **L T P**
3 1 0

UNIT-I
Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**
Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**
Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

REFERENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

PATTERN RECOGNITION

NCS-080 **L T P**
3 1 0

Unit-I

Introduction: **8**

Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: **8**

Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods: **12**

Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: **8**

Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: **8**

Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

HIGH PERFORMANCE COMPUTING

NCS-081	L	T	P
	3	1	0

UNIT I **10**

Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.

UNIT II **10**

Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.

UNIT III **10**

Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,

UNIT IV **10**

Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).

UNIT V5

Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.

TOTAL: 45 PERIODS

REFERENCES:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, “Grid Computing: Practical Guide to Technology & Applications”, Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004.
4. lan Foster, et al.,“The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

REAL TIME SYSTEM

NCS-082 **L T P**
3 1 0

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

CLUSTER COMPUTING

NCS-083	L	T	P
	3	1	0

UNIT I:

Basic concepts in Distributed Systems

Notion of time Distributed Mutual exclusion, Consensus, Failure models Paradigms for process interaction in distributed programs, Programming Paradigms, Shared memory, Message passing, Workflows

UNIT II:

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT III:

Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory,

UNIT IV:

Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT V:

System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

TOTAL: 45 PERIODS

REFERENCES:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, KaiHwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

GRID COMPUTING

NCS-084	L	T	P
	3	1	0

UNIT I

CONCEPTS AND ARCHITECTURE 10

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II

GRID MONITORING 10

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III

GRID SECURITY AND RESOURCE MANAGEMENT 10

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV

DATA MANAGEMENT AND GRID PORTALS 10

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V

GRID MIDDLEWARE 5

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

REFERENCES:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality, Wiley
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.

DATA COMPRESSION

NCS-085 **L T P**
3 1 0

Unit - I: **10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: **10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: **10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

REFERENCES:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING

NCS-086	**L**	**T**	**P**
	3	**1**	**0**

UNIT I 10
FUNDAMENTAL CONCEPTS
Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II
QUANTUM COMPUTATION 10
Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III
QUANTUM COMPUTERS 10
Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

UNIT IV
QUANTUM INFORMATIONS 10
Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

UNIT V
QUANTUM ERROR CORRECTION 5
Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

TOTAL: 45 PERIODS

TEXT BOOK

1. Micheal A. Nielsen. &Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. DavidMermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

EMBEDDED SYSTEMS

NCS-087	**L**	**T**	**P**
	3	1	0

Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088 **L T P**

3 1 0

UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

[Effective from Session 2013-14]

(1st Year)

[Common to all B.Tech. Branch except Agricultural Engineering]

B.Tech. First Year (Common to all B.Tech. Courses except B.Tech. Agricultural Engg.)

(Effective from the session 2013-14)

Semester-I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ NAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. **E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books **L T P 3 1 0**

Unit -1	**1st Book**	**10 Lecture**
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche)	**Chapter 1/1**	**2**
Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	**Chapter 2/1**	**6**
Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**Chapter 16/1**	**2**
Unit II	**1st Book**	**12 Lecture**
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	**Chapter 3/1**	**2**
DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier	**Chapter 4/1**	**6**
Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	**Chapter 6/1**	**4**
Unit III	**1st Book**	**6 Lecture**
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	**Chapter 10 10.1,10.4, 10.5, 10.9 1st Book**	**6**
Unit IV	**2nd Book**	**4 Lecture**
Digital Voltmeter : Introduction, RAMP Techniques **Digital Multimeters**: **Oscilloscope**: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	**5.1, 5.2 2rd Book 6.2 2nd Book 7.1,7.2,7.3, 7.4,7.5,7.20 2nd Books**	**4**
Unit V	**3rd Book**	**8 Lecture**
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	**Chapter 1, 2 3rd Book**	**8**

Text Books

1. Robert L. Boylestad &Louis Nashelsky "**Electronic Devices and Circuit Theory**" , Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "**Electronics Instrumentation**," Third Edition, TMH Publication 2012

3. George Kennedy, "**Electronic Communication System**", Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell " **Electronics Devices and Circuits**", 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "**Electronics Devices and Circuits**", 3rd Edition , TMH 2008

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202

ENGINEERING CHEMISTRY

L	T	P
3	1	0

UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^{1H}NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	**Force Systems:** • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. **Friction:** • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.	8
II	**Basic Structural Analysis:** • **Plane Truss**, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.	8
III	**Centroid and Moment of Inertia:** • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.	8
IV	**Kinematics of Rigid Body:** • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity **Kinetics of Rigid Body:** • Introduction, Force, Mass and Acceleration, Newton's law of	9

	motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum.	
V	**Mechanics of Deformable Solids:** • **Simple stress and strain**: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • **Bending of Beams**: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • **Theory of Torsion**, Torque and twist, Shear stress due to torsion circular sections.	**08**

References:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiah, University Press.
12. "Engineering Mechanics" , K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

NEE101/NEE201: ELECTRICAL ENGINEERING

L T P 3 1 0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation

Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems) 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

(Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

L	T	P
3	1	0

Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics **06 Hrs**.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II **06 Hrs.**

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III **10 Hrs.**

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV **08 Hrs.**

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NME-101/201: Basic Manufacturing Processes L T P [2 0 0]

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. **1**

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. **2**

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. **2**

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. **2**

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working **4**

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. **3**

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. **1**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **3**

Misc. Processes: Introduction to Galvanizing and Electroplating. **1**

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

NAS 105/ NAS 205 : ENVIRONMENT AND ECOLOGY

2 0 0

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.
Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Enginnering Mathematics,Volume-II,John Wiley&Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing Hous**e.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I **07 Hrs**

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II **08 Hrs**

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III **06 Hrs.**

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV **09 Hrs**

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

NME-152/NME/252 : Engineering Mechanics Lab

L T P [0 0 2]

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

NEE151/NEE251 : ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

    Between 90-100%----------Print 'A'
    80-90%----------Print 'B'
    60-80%----------Print 'C'
    Below 60%----------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

    Train No.: *integer type*
    Train name: *string*
    Departure Time: aggregate type TIME
    Arrival Time : aggregate type TIME
    Start station: string
    End station : string

    The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

    (i) List all the trains (sorted according to train number) that depart from a particular section.
    (ii) List all the trains that depart from a particular station at a particular time.
    (iii) List all he trains that depart from a particular station within the next one hour of a given time.
    (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

L T P
[0 1 3]

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

NCE-151/251 : Computer Aided Engineering Graphics

L T P

0 1 3

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

NAS-151/NAS-251: PHYSICS LAB

L T P
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS
2nd Year

[Effective from Session 2014-15]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering
4. B.Tech. Electronics & Instrumentation Engineering
5. B.Tech. Instrumentation & Control Engineering
6. B. Tech. Applied Electronics and Control Engineering
7. B. Tech. Biomedical Engineering

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-III

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031-NOE-039	Engg. Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-IV

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/ NAS-401	Science based Elective/Engg. Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/ NHU-402	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/ AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Syllabus Third semester

THEORY SUBJECTS

NEC-301 NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II.	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III.	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV.	Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.	12.1 to 12.3	6
V.	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.

2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II.	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III.	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	8
IV.	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	8
V.	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books:1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press. 2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.			

NEC-303 SIGNALS AND SYSTEMS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Signals**: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II.	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III.	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV.	**Systems**: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V.	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10

Text Book: P. Ramakrishna Rao, 'Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

Chi-Tsong Chen, 'Signals and Systems', 3rd Ed., Oxford University Press, 2004

V. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

NEC-304 SWITCHING THEORY AND LOGIC DESIGN			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Digital system and binary numbers: Signed binary numbers, binary codes. Gate-level minimization: The map method up to four variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	5
II.	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III.	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	5.1 to 5.5, 5.7 to 5.8 9.1 to 9.7	9
IV.	Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.	6.1 to 6.5 7.1 to 7.3, 7.5to 7.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education			
Reference Books: 1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley. 2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and Principles", CRC Press Taylor & Francis group, 2010.			

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB.

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

Syllabus fourth semester

THEORY SUBJECTS

NEC-401 DATA STRUCTURE		3 1 0
Unit	Topic	Proposed number of Lectures
I.	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	8
II.	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8
III.	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	8
IV.	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	8
V.	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort	8

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI

References

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill
3. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
4. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH
5. G A V Pai, “Data Structures and Algorithms”, TMH

NEC-402 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II.	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III.	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV.	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V.	**Feedback:** The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	7
Text Book: A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Ed.			
Reference Books: Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Ed TMH			

NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II.	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III.	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4,7.5 8.2 to 8.4, 8.9	8
IV.	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4,9.5, 9.7, 9.9, 9.12,10.1, 10.3,10.4, 10.5	8
V.	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2 ,12.3, 13.2, 13.4	8

Text Book: David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.

Reference Books:

Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.

NEC-404 ELECTROMAGNETIC FIELD THEORY			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II.	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III.	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV.	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd			

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective - To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator

Field Effect Transistors-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier

Bipolar Transistors- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.

Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier

Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain.

Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier

Oscillators -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator

Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC- 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements

U.P. TECHNICAL UNIVERSITY
LUCKNOW

Syllabus
of
3rd yr. (V & VI Semester)

1. **Electronics & Communication Engineering**
2. **Electronics Engineering**
3. **Electronics & Telecommunication Engineering**

B.TECH. COURSES

U.P.TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

YEAR III, SEMESTER-V

B. Tech. (1)Electronics and Communication Engineering (2) Electronics and (3) Electronics & Telecommunication Engineering

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY										
1.	TEC-501	Principles of Communication	3	1	0	30	20	50	100	150
2.	TEC-502	Analog Integrated Circuits	3	1	0	30	20	50	100	150
3.	TEC-503	Microprocessors and applications	3	1	0	30	20	50	100	150
4.	TEC-504	Automatic Control System	3	1	0	30	20	50	100	150
5.	TEC-505	Antenna & Wave Propagation	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	TEC-551	Communication Lab - I	0	0	2	-	20	20	30	50
7.	TEC 552	Analog Integrated Circuits Lab	0	0	2	-	20	20	30	50
8.	TEC-553	Microprocessors Lab	0	0	2	-	20	20	30	50
	TEC-554	Control System Lab	0	0	2	-	20	20	30	50
8.	GP 501	General Proficiency	-	-	-	-	-	50	-	50
		Total	**15**	**5**	**8**	-	-	-	-	**1000**

YEAR III, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY										
1.	TAS-601	Industrial Management	3	1	0	30	20	50	100	150
2.	TEC-601	Digital Communication	3	1	0	30	20	50	100	150
3.	TEC-602	Digital Signal Processing	3	1	0	30	20	50	100	150
4.	TEC-603	VLSI Technology and Design	3	1	0	30	20	50	100	150
5.	TEC-604	Microwave and Radar Engg.	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	TEC-651	Communication Lab - II	0	0	2	-	20	20	30	50
7.	TEC-652	Digital Signal Processing LAB	0	0	2	-	20	20	30	50
8.	TEC-653	Electronics CAD Lab	0	0	2	-	20	20	30	50
	TEC-654	Microwave Lab	0	0	2	-	20	20	30	50
9.	GP-601	General Proficiency	-	-	-	-	-	50	-	50
		Total	**15**	**5**	**8**	-	-	-	-	**1000**

Note- 4 to 6 Weeks Industrial Interaction after VI semester exam to be evaluated in VII semester

YEAR III, SEMESTER-V

Syllabus B. Tech. (1)Electronics and Communication Engineering (2) Electronics and (3) Electronics & Telecommunication Engineering

Principles of Communication (TEC-501)

Unit	Topic	Text Book/ Chapter	Lectures
1	Introduction: Communication Process, Source of Information, Communication channels, base-band and pass-band signals, representation of signal and systems, the modulation process, primary communication resources, analog versus digital communications.	2/1	06
2	Amplitude modulation: Frequency division and time division multiplexing, suppressed carrier systems, single side band transmission, amplitude modulation with carrier power, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial side band transmission.	1/3	07
3	Angle Modulation: Narrow and wide band FM, multiple frequency and square wave modulation, linear and non-linear modulation, phase modulation, Demodulation of FM signals, noise reduction.	1/4	06
	Pulse Modulation: Pulse amplitude modulation, other forms of pulse modulation, band width required for transmission PAM signals, Comparison of frequency division and time division multiplexed systems	1/5	06
4	Noise: Different types of noise, noise calculations, equivalent noise band width, noise figures, effective noise temperature, noise figure in cascaded stages.	1/6	06
5	Performance of Communication Systems : Noise calculation in communication systems, noise in Amplitude Modulated, Angle modulated and Pulse Modulated systems, comparison of coded and un-coded systems	1/7	06
	Introduction to Information Transmission:Measure of information, channel capacity, transmission of continuous signals, exchange of band width for signal to noise ratio, Efficiency of PCM systems	1/8	05

Text Book:

1. B. P. Lathi, “Communication Systems”, BS Publications”, Hyderabad, 2004.

Reference Book:

1. Simon Haykin, “Communication Systems”, John Wiley & Sons, 1999, Third Edition.

Taub and schilling, “Principles of Communication Systems” TMH

Analog Integrated Circuits (TEC-502)

Unit	Topic	Text Book/ Chapter	Lecturers
1	IC OP-AMP applications: OP-AMP Fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics) Basic building blocks using OP-AMPS. Inverting/Non-inverting VCVS, Integrators, Differentiators, CCVS and VCCS, Instrumentation Amplifiers.	1/ 2, 6 & 7	08
2	Waveform Generator: Square wave generators: 555Timer, Crystal controlled Oscillator Ramp Generator: Triangle generator, Sawtooth generator Sine wave generator: Requirement for sinusoidal oscillations, Wien-bridge and twin-T oscillators. Function Generators: Multi op-amp function generators, IC function generators Digitally controlled frequency synthesizer: PLL Fundamentals, PLL synthesizer, Totally digital synthesizer.	2/ 6	08
3	Active Filters: Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter, Higher order filters. High pass active filter. Band pass filter: single op-amp band pass filter, multistage band pass filter State variable filter	2/7	08
4	Non-linear Circuits: Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator. IC Analog Multiplier applications OTA	2/8	08
5	Voltage Regulators: OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.	2/3	08

Text Book:

1. Sedra and Smith, Microelectronic Circuits", Oxford University press, 5th Edition, 2005.
2. J. Michael Jacob, Applications and design with Analog Integrated Circuits", PHI, 2nd Edition, 2004.

Reference Book :

1. B.P. singh and Rekha Singh, Electronic Devices an Integrated Circuits; Pearson Education, 1st Edition 2006.

Microprocessors and Applications (TEC- 503)

Unit	Topic	Text Book/ Chapter	Lectures
1	Introduction to Microprocessors: Evolution of Microprocessors, History of computers, Timing and control, memory devices: semiconductor memory organization, Category of memory, 8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Assembly Language Programming.	1/2 1/3 14 1/6	8
2	16-bit Microprocessors (8086/8088): Architecture, Physical address,	2//2	10

	segmentation, memory organization, Bus cycle, Addressing modes, difference between 8086 and 8088, Introduction to 80186 and 80286, Assembly Language Programming of 8086/8088.		
3	Data Transfer Schemes: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Priority Controller (8259)	1/8, 1/8 1/11,1/10 , 1/12	8
4	Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications. ADC and DAC: Introduction, DAC memthodes, ADC converters, Types of ADC, ADC IC (0808/0809, DAC and ADC Interfacing and Applications.	1/9 1/13	8
5	Advanced Microprocessors: Introduction to 32-bit and 64-bit microprocessors, PowerPC, Microcontroller (8051): Introduction, Architecture, Instruction set.	2/3, 2/4 2/5, 2/7	8

Text Books

1. R. Singh and B. P. Singh : Microprocessor Interfacing and Application, New Age International Publishers, 2nd Edition.
2. B.P. Singh and R. Singh : Advanced Microprocessor and Microcontrollers, New Age International Publishers, 2nd Edition.

Reference Books

1. D. V. Hall : Microprocessors Interfacing, TMH (2nd Edition).
2. R. S. Gaunkar: Microprocessor Architecture, Programming and Applications with 8085/8080, Penram Publication
3. Y.C. Liu and G.A. Gibson : Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design, PHI 2nd Edition,

Automatic Control System (TEC- 504)

Unit	Topic	Text Book/ Chapter	Lectures
1	Introduction to open loop and closed loop control systems, feedback characteristics of control systems, Mathematical Representation of physical systems Electrical, Mechanical, Hydraulic, Thermal systems, Block diagram algebra and signal flow graphs, Mason's gain formula.	1/1, 1/2	8
2	**Time Domain Analysis:** Standard Test Signals, Time response of First, Second and Higher order systems, Performance Indices. **Error Analysis:** Static and Dynamic Error Coefficients, Effect of adding poles and zeroes to the system, response of P, PI, and PID controllers.	1/5	10
3	**Concept of Stability:** Concept of stability, Asymptotic and conditional stability, Routh Hurcoitz Criterion, Root Locus technique (Concept and construction) **Frequency Response Analysis:** Correlation between time and frequency response, polar and inverse polar plots, Nyquist stability criterion, Bode plots, All pass and minimum phase systems, M and N circle.	1/6, 1/7, 1/8	9
4	**Design through compensation techniques:** Realization of lag, lead and lag-lead compensators, Design of closed loop control system using root locus and Bode plot Compensation	1/10	7
5	**Stable Variable Analysis:** Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function.	1/12, 1/14	9

	Advances in Control Systems: Basic Introduction to Neural Networks and Fuzzy logic control.		

Text Books:

1. I J Nagrath & M Gopal, Control System Engineering; New Age International publishers.

Reference Books:

1. B C Kuo, Automatic Control Systems; PHI
2. Norman S Nise, Control System Engineering;John Wiley & Sons, Singapore
3. Dr D Ganesh Rao, Control System; Sanguine Technical Publisher, Bangalore
4. K Ogata, Modern Control Engineering; PHI.

Antenna and Wave Propagation (TEC-505)

Unit	Topic	Text Book/ Chapter	Lectures
1.	**Antenna Principles:** Potential Functions & Electromagnetic Field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance.	1/10	4
	Network Theorems Directional Properties of Dipole Antenna.	1/11	1
	Antenna Gain, Effective Area, Antenna Terminal Impedance, Practical Antennas and Methods of Excitation, Antenna Temperature and Signal to Noise Ratio.	1/11	4
2.	**Antennas Arrays:** Two Element Array, Horizontal Patterns in Broadcast Arrays, Linear Arrays, Multiplication of patterns, effect of the earth on vertical patterns, Binomial array.	1/11	6
3.	**Wave Propagation:** Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Refelection and refraction waves by the Ionosphere Tropospheric Wave.	1/16	3
	Ionosphere Wave Propagation in the Ionosphere, Virtual Height, MUF Critical frequency, Skip Distance, Duct Propagation, Space wave	1/17	4
4.	Practical antennas: VLF and LF transmitting antennas, effect of antenna height, Field of short dipole, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, Yagi-Uda array: Square corner yagi-uda hybride, circular polarization Rhombic Antenna: Weight and Leg length Parabolic Reflectors: Properties, Comparison with corner reflectors Horn Antenna: Length and Aperture. Introduction to Turstile Antenna Effect of ground on antenna performance. Broadband Antenna: Frequency independent concept, RUMSEY's Principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral Antenna.	 2/4 2/11 2/11 2/12 2/13 2/16 2/16 2/15	11
5.	Antenna Measurements: Radiation Pattern measurement, Distance requirement for uniform phase, uniform field amplitude requirement, Introduction to phase measurement; Gain Measurement: Comparison method, Near field method, Introduction to current distribution measurement, Measurement of antenna efficiency, measurement of Noise figure and noise temperature of an antenna polarization measurement.	2/18	9

Text Books:

1. Jordan Edwards C. and Balmain Keith G./ "Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)
2. Kraus, John D. & Mashefka, Ronald J. / "Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.

Reference Books:

1. Prasad, K.D./ "Antennas and Wave Propagation"/ Khanna Publications
2. Collin, R. / "Antennas and Radiowave Propagation" / Tata McGraw-Hill
3. Hayt Jr. William H./ "Engineering Electromagnetics "/ Tata McGraw-Hill
4. Das, Annaparna & Das, Sisir K. / "Microwave Engineering"/ Tata McGraw Hill.
5. Roy, Sitesh Kumar & Mitra, Monojit / "Microwave Semiconductor Devices" / Prentice Hall (India).

Communication Lab-I (TEC-551)

1. To study Amplitude modulation using a transistor and determine depth of modulation.
2. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
3. To study frequency modulation using reactance modulator.
4. Study of frequency modulation using varactor modulator.
5. Narrow band FM generator using Armstrong method.
6. Study of Foster- Seely discriminator.
7. Generation of DSB-SC signal using balanced modulator.
8. Generation of single side band signal.
9. Study of phase lock loop and detection of FM signal using PLL.
10. Measurement of noise figure using a noise generator.
11. Study of superheterodyne AM receiver and measurement of sensitivity, selectivity & fidelity.
12. Study and demonstration of active filter (low pass, high pass, and band pass type) .

Analog Integrated Circuits Lab (TEC-552)

1. Measurement of Op-amp Parameters. (Open Loop Gain, Input offset Voltage, CMRR, Slew rate)
2. Determination of Frequency response of Op-Amp.
3. Precision Rectifier
4. Instrumentation Amplifier.
5. Open Loop operation of Op-amp -Comparators - Schmitt Trigger.
6. Astable & Monostable Operation Using 555.
7. IC Voltage Regulator.
8. Voltage Controlled Oscillator.
9. Phase Locked Loop.
10. Frequency Multiplier
11. A/D Converters & D/A Converters.
12. Second Order Active Filter- High Pass & Low Pass Realization

Microprocessor Lab (TEC- 553)

8085/8086 Based Experiments
1. Signed Multiplication using Booth's Algorithm.
2. Recursive routine for finding Factorial N.
3. Look up table method for finding the ASCII of an alphanumeric code.
4. Interfacing with 8255 in I/O mode/BSR mode.
5. Interfacing with 8253.
6. Verification of Interrupts.
7. Interfacing with ADC/DAC.
8. Mini Project on some interfacing applications.
9. Serial communication between two kits through RS-232C using 8251.

Note :
In addition, Institutes may include two more experiments based on the expertise

Control System Lab (TEC-554)

1. To use D.C. potentiometers as an error detectors.
2. To verify characteristics of (a) self excited magnetic amplifiers, (b) Self excited magnetic amplifier with (i) Positive feedback (ii) Negative feedback.
3. To draw characteristics of (a) Series connected (b) Parallel connected magnetic amplifier.

4. To draw characteristics of synchro torque transmitters. Also draw the characteristics error detector using of two synchros.
5. To study speed control of universal motor using SCR and stroboscope
6. Speed control of AC motor using TRAIC.

YEAR III, SEMESTER-VI

Industrial Management (TAS-601)

Unit	Topic	Text Book/ Chapter	Lectures
1	What is Operations Research? OR-research model, solving the OR model, Queuing and simulation models, Art of modeling, Phases of OR study.	1/1 Except 1.5, 1.7	2
2.	**Introduction to Linear Programming:** Two variable L-P model, Graphical LP solution, Analysis of selected LP models.	1/2.1, 2.2, 2.5	3
	The Simplex Method: LP solution space, Graphical to algebraic solution, The simplex method, Artificial starting solution, Special cases in simplex method applications.	1/3	4
	Transportation Model and its Variants: Definition of transportation model, Non-traditional transportation models, Transportation algorithms, Assignment model	1/5 Except 5.5	4
3.	**Network Models**: Network definitions, Minimal spanning tree algorithm, CPM and PERT.	1/6.1, 6.2, 6.6	4
	Game Theory: Optimal solution of two persons zero sum games, Solution of mixed strategy games.	1/ 14.4	2
4.	Introduction to Patents and Intellectual Propriety Right	Notes Supplied by UPTU	3
	Introduction to Engineering Management: Engineering and Management Historical Development of Engineering Management	 1/1 1/2	3
5.	**Functions of Technology Management** Planning and Forecasting Decision Making Organizing Motivating and Leading Technical People Controlling	 2/3 2/4 2/5 2/7 2/8	6
	Project Management Project Planning and Acquisition Project Organization, Leadership, and Control	 2/14 2/15	4

Text Books:

1. Hamdy H Taha, Operations Research – An Introduction; 7e, Pearson Education/ PHI – 2002.
2. Babcock & Morse, Managing Engineering and Technology; Pearson Education, 2004

Reference Books:

1. Hillier & Hillier, Introduction to Management Science; TMH Ed 05

.

Digital Communication (TEC-601)

Unit	Topic	Text Book/ Chapter	Lectures
1.	**Elements of Digital Communication and Information Theory** Model of a Digital Communication, System, Probability Theory and Random Variables, Logarithmic Measure of Information, Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix Doing and Kraft Inequality, Shannon-Fanno and Huffman Coding.	1/9 1/9	5 4
2	**Digital Base band Transmission** PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding and Their Power Spectra (No Derivation) Matched Filter Reciver, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio. Correlation Detector Decision Threshold and Error Probability For Binary, Unipolar(ON-OFF) Signalling, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum.	1/4 1/5 1/4	4 4
3 & 4	**Digital Modulation Techniques** Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques. **Digital Multiplexing** Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 to T4 PCM TDM System (DS1 to DS4 Signals)	1/6 1/3	11 3
5	**Error Control Coding** Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Encoder and Decoder For Cyclic Codes, Convolution Codes, Tree diagram state diagram and Trellis Diagram, Viterbi and Sequential Decoding, Comparison of Performance.	1/10	9

Text Book:

1. Haykin, Simon / "Communication Systems" / John Wiley / 4th Ed.

References Books:

1. Singh, R.P. & Sapre, S.D. / "Communication Systems: Analog & Digital" / Tata McGraw-Hill.
2. Lathi, B.P / "Modern Digital & Analog Communication Systems" / Oxford University Press /.
3. Simon Haykin / "Digital Communication" / John Wiley.

4. Taub & Schilling / “Principles of Communication Systems” / Tata McGraw-Hill /
5. A.B. Carlson / “Communication Systems” / Tata McGraw-Hill.
6. Prokis J.J / “Digital Communications” / McGraw Hill /
7. Charkrabarti, P. / “Analog Communication Systems” / Dhanpat Rai & Co.
8. Schaum’s Outlines / “Analog & Digital Communication” / Tata McGraw-Hill.
9. Kennedy, George & Davis, Bernard / “Electronic communication systems” / Tata McGraw-Hill /

Digital Signal Processing (TEC-602)

Unit	Topic	Text Book/ Chapter	Lectures
1.	**Discrete Fourier Transform:** Frequency Domain Sampling: The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT.	1/5	10
2.	**Efficient Computation of DFT** Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, Efficient computation of the DFT of a 2N-Point real sequences, Gortezel Algorithm, Chirp Z-transform algorithm.	1/6	10
3.	Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter structures-. Direct form structure, frequency sampling structure, Lattice structure, Linear phase FIR structure . FIR structures.	1/7	08
4.	Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency Sampling Method, Design of FIR, Equiripple filter design Differentiators. Design of Hilbert Transformers.	1/8	08
5.	**Design of IIR Filters From Analog Filters:** IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters.	1/8	08

Text Books:

1. Proakis, J.G. & Manolakis, D.G., “Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall (India).

Reference Books:

1. Sanjit K. Mitra, “Digital Signal Processing”, Third Edition, TMH, 2005
2. Oppenheim A.V. & Schafer, Ronald W., “Digital Signal Processing”, Pearson Education.
3. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, PHI.
4. DeFatta, D.J., Lucas, J.G. & Hodgkiss, W.S., “Digital Signal Processing”, John Wiley & Sons

VLSI Technology and Design (TEC-603)

Unit	Topic	Text Book/ Chapter	Lectures

1	**1.Era of Integrated Circuit:** Introduction to Monolithic Integrated Circuit Technology, Bipolar & MOS IC, Film IC 2. **Crystal Growth:** Silicon wafer Preparation & characterization, **Oxidation:** Thermal oxidation, Oxide thickness measurement, Oxidation system.	 1	2 6

2.	**Diffusion** of dopants: Diffusion Eqns. Dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, **Ion Implantation**: Ion implantation techniques, dopant profiles, apparatus used, **Exitaxy**: Eepitaxial growth of Si, apparatus for epitaxy, Photolithography techniques for pattern transfer, Mask making, photo resist & **Etching** techniques. **Film Deposition**: Vacuum deposition & Sputtering apparatus, CVD Processes and its applications in IC Lab, **Metallization**	1	8
3.	**1.MOS Transistor:** MOS Structure, MOS/IGFET Devices, MOS System under external bias, Structure & operation of MOSFET, Enhancement mode & Depletion mode devices, I-V Characteristics, MOSFET Scaling & Small-Geometry Effects. **2.CMOS Basic Circuits**: MOS Inverters, static & dynamic characteristics, NAND, NOR, AOI Circuits, Design Considerations, Layout Design, Micron & Submicron technologies, parasitic effects, Physical limitations, Concepts of SPICE for Circuit simulation.	2	6 4
4.	**Standard Digital ICs:** Combinational and Sequential MOS Logic Circuits, Design of standard Cells for LSI, VLSI Circuits, Computer-Aided Design Technology, Semiconductor Memories: DRAM, SRAM, Flash	3	7
5.	**Programmable Logic Devices**: PLA, PAL, PLD/CPLD, PGA/FPGA, ASIC, VLSI Testing.	3	7

Text Books:

1. S.M. Sze (Ed.) / VLSI Technology / M Hill. 1988.
2. Basic VLSI Design by D.A. Pucknell & Eshraghian (PHI)
3. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)

References

1. S. Gandhi / VLSI Fabrication Principles / 2nd ED. John Willey 1994.
2. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)
3. S.A. Campbell / The Science and Engineering of Microelectronic Fabrication / Oxford Univ. Press 1996
4. Introduction to Digital Microelectronics Circuits by K. Gopalan (TMH)
5. Microelectronic Circuits *International Student Edition* by Sedra / Smith (Oxford)
6. Microelectronics by Milman & Grabel (Mc Graw-Hill)

Microwave & Radar Engineering (TEC-604)

Unit	Topic	Text Book/ Chapter	Lectures
1.	Propagation through waveguides: Rectangular waveguide, solution of wave equation in rectangular co-ordintes, Derivation of field equations for TE & TM modes degenerate and dominant mode, Power Transmission and Power loss, Excitation of waveguides, non existence of TEM mode in waveguides, Introduction to circular Waveguides, Stripline and microstripline.	¼, 1/11	9

2.	Microwave cavity resonators: Rectangular and cylindrical cavities, Quality factor, Excitation of cavities. Microwave components: Waveguide couplings, bends and twists, Transitions, Directional couplers, hybrid couplers, Matched load, Attenuators and phase shifters, E-plane, H-plane and Hybrid Tees, Hybrid ring, Waveguide discontinuities, Windows, Irises and Tuning screws, Detectors, wave meters; Isolators and Circulators, tunable detector, slotted line carriage, VSWR meter. Scattering Matrix.	¼ 2/6	2 8
3.	Microwave Measurements: Measurement of frequency, Wave length, VSWR, Impedance, Attenuation, Low and high power. Radiation pattern.	3/10	6
4.	Limitation, of conventional active devices at Microwave frequency.	1/9	1
5.	Microwave Tubes : Klystron, Reflex Klystron, Magnetron, TWT, BWO: Their schematic, Principle of operation, performance characteristics and application.	1/10	6
6.	Microwave Semiconductor Devices: PIN diode, Tunnel diode, LSA diode, varactor diode, Gunn Devices, IMPATT and TRAPATT, their Principal of operation, characteristics and applications.	1/5, 1/7, 1/8	8
7.	Principles of Radar: Radar Block diagram operation, Radar Range equation, Radar Frequencies, Pulse and C.W. Radar, Introduction to Doppler and M.T. Radar, Applications.	1/1, 1/2, 1/3	6
8.	Radar Transmitters & Devices: Block diagram of radar receiver for C.W. and pulse radar, front end amplifier, Receiver noise figure, Duplexers Radar antennas, Radar Displays, Introduction to Radar clutter.	1/10, 1/11, 1/7	8

Text Book:

1. Liao, S.Y. / Microwave Devices & Circuits; PHI 3rd Ed.

2. M.I. Skolnik, Introduction to Radar Engineering; THM

Reference:

1. Collin, R.E. Foundations for Microwave Engineering; TMH 2nd Ed.
2. Rizzi, Microwave Engineering: Passive Circuits; PHI.
3. A Das and S.K. Das, Microwave Engineering; TMH.

Communication Lab-II (TEC-651)

1. Study of Sample and hold circuit using Op-amp- ST2101

2. Study of PAM generation and detector and observe characteristics of both single and dual polarity pulse amplitude modulation.

3. Study of pulse width modulation and demodulation.

4. Study of pulse position modulation demodulation.

5. Study of delta modulation and demodulation and observe effect of slope overload DCL-07.

6. Study of pulse data coding techniques for NRZ formats.

7. Data decoding techniques for NRZ formats. ST2106-7.

8. Study of amplitude shift keying modulator and demodulator.

9. Study of frequency shift keying modulator and demodulator.

10. Study of phase shift keying modulator and demodulator ST-467

11. Study of single bit error detection and correction using Hamming code. ST-2103.

12. Study of Pulse code modulation and demodulation.

Digital Signal Processing Lab (TEC-652)

1. Sampling & Waveform Generation.
2. Quantization
3. PCM Encoding
4. Delta Modulation
5. Digital Modulation Schemes (ASK, PSK, FSK)
6. Error Correcting Codes
7. DFT Computation.
8. Fast Fourier Transform.
9. FIR Filter implementation.
10. IIR Filter implementation.
11. DSP Processor Implementation
12. Computational Experiments with Digital Filters

Electronics CAD Lab (TEC-653)

1. Design, Simulation and Analysis of following circuits using Circuit simulator:
    a. Pushpull Amplifier.
    b. Differantial Amplifier
    c. NMOS and CMOS inverter
    d. Two input NAND Gate
    e. Two input NOR Gate
2. Layout Design of NMOS and CMOS Inverter using Layout Generator
3. Layout Design of Two Input NAND Gate
4. Simulation of Full Adder using HDL
5. Chip Design using VHDL (Mini Project).

Microwave Engineering Lab (TEC-654)

1. Measurement of guide wavelength and frequency of the signal in a rectangular waveguide.
2. Measurement of VSWR using slotted line.
3. Study of mode characteristics of reflex Klystron and determination of mode number, transit time & electronic tuning sensitivity.
4. Study of characteristics of Gunn oscillator.
5. Study of Gunn diode as modulated source (PIN modulation) and determination of modulation depth.
6. Measurement of coupling coefficient and directivity of a directional coupler.
7. Study of insulation & coupling coefficient of a magic T.
8. Measurement of attenuation using substitution method and plot of attenuation versus frequency characteristics.
9. Study of waveguide horn and its radiation pattern and determination of the beam width.
10. Study of a ferrite circulator and measurement of isolation, insertion loss, cross coupling and input VSWR.
11. Measurement of microwave power using power meter

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins," Carrier-Grade VoIP", McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, "IP Telephony – Deploying Voice Over-IP Protocols", John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

NEC 041 ELECTRONIC SWITCHING		3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication Switching Systems and Networks", PHI.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

for

B. Tech. Electrical Engineering

B.Tech. Electrical & Electronics Engg.

of

Second Year

(Effective from the Session: 2014-15)

STUDY AND EVALUATION SCHEME											
B-Tech. Electrical Engg./Electrical & Electronics Engineering											
								YEAR: 2nd SEMESTER-III			
Sl. No.	COURSE NO	SUBJECT	PERIOD			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL EVALUATION			EXAM ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECTS											
1	NAS-301/-NOE 031-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NME-309	Thermal & Hydraulic Machines	3	1	0	30	20	50	100	150	4
3	NEE-301	Electro-Mechanical Energy Conversion–I	3	1	0	30	20	50	100	150	4
4	NEE-302	Electrical Measurement & Measuring Instruments	3	1	0	30	20	50	100	150	4
5	NEE-303	Basic System Analysis	2	1	0	15	10	25	50	75	3
6	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
7	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL / DESIGN / DRAWING											
8	NME-359	Thermal & Hydraulic Machines Lab	0	0	3	10	10	20	30	50	1
9	NEE-351	Electromechanical Energy Conversion- I Lab	0	0	3	10	10	20	30	50	1
10	NEE-352	Electrical Measurement Lab	0	0	2	10	10	20	30	50	1
11	NEE-353	Numerical Technique Lab	0	0	2	10	10	20	30	50	1
12	NGP-301	General Proficiency Lab	-	-	-	-	-	50	-	50	
		Total	**17**	**5**	**7**					**1000**	**25**

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Note: Numbers of departmental subjects/labs in any semester may vary as per requirement keeping subject total and credit total unchanged.

STUDY AND EVALUATION SCHEME											
B-Tech. Electrical Engg./Electrical & Electronics Engineering											
								YEAR: 2nd SEMESTER-IV			
Sl. No.	**COURSE NO**	**SUBJECT**	**PERIOD**			**EVALUATION SCHEME**				**SUBJECT TOTAL**	**CREDIT**
						SESSIONAL EVALUATION			**EXAM ESE**		
			L	**T**	**P**	**CT**	**TA**	**TOTAL**			
THEORY SUBJECTS											
1	NOE 041-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NEC-409	Analog & Digital Electronics	3	1	0	30	20	50	100	150	4
3	NEE-401	Electro-Mechanical Energy Conversion–II	3	1	0	30	20	50	100	150	4
4	NEE-402	Network Analysis and Synthesis	3	1	0	30	20	50	100	150	4
5	NEE-403	Instrumentation & Process Control	2	1	0	15	10	25	50	75	3
6	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
7	AUC-002/ AUC-001	*Cyber Security/ Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	-
PRACTICAL / DESIGN / DRAWING											
8	NEC-459	Electronics Lab	0	0	3	10	10	20	30	50	1
9	NEE-451	Electro-Mechanical Energy Conversion – II Laboratory	0	0	3	10	10	20	30	50	1
10	NEE-452	Network Lab	0	0	2	10	10	20	30	50	1
11	NEE-453	Electrical Instrumentation Lab	0	0	2	10	10	20	30	50	1
12	NGP-401	General Proficiency	-	-	-			50	-	50	
		Total	**16**	**5**	**10**					**1000**	**25**

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NME-309 :THERMAL AND HYDRAULIC MACHINES L : T : P::3 : 1 : 0

UNIT-I :

Thermodynamic equilibrium, cyclic process, enthalpy, Zero, first and second laws of thermodynamics, Carnot cycle, concept of entropy, properties of steam, processes involving steam in closed and open systems, Enthalpy.

Vapour Pressure Cycles: Rankine cycle, reheat cycle, Regenerative cycle

UNIT-II:

Steam Turbine: Theoretical approach only of Classification, impulse and reaction turbines their velocity diagrams and related calculations, work done and efficiencies, re-heat factor, staging, bleeding and governing of turbines**.**

Gas Turbine: Theoretical approach only of Classification, Brayton cycle, working principle of gas turbine, gas turbine cycle with intercooling, reheat and regeneration, stage and polytrophic efficiencies**.**

UNIT-III:

Otto, Diesel .and Dual cycles, introduction to 2-stroke and 4-stroke SI and CI engines

UNIT-IV

Impact of Jet: Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat and curve).

Hydraulic Turbines: Classification, heads and efficiencies, construction, working, work done and efficiency of impulse turbines.

UNIT-V

Centrifugal Pump: Classification, construction, working.

Reciprocating Pump: Classification ,construction, working.

Text Books:

1. Onkar Singh “Applied Thermodynamics” New Age International, 2006.
2. Steam & Gas Turbine by R.Yadav, CPH Allahabad
3. R.K.Rajput“ A Text Book of Hydraulic Machines” S. Chand & Co.,2008.

Reference Books:

4. P.L.Ballany “Thermal Engineering “ Khanna Publishers, 2003
5. R.K.Bansal “A Text Book of Fluid Mechanics and Hydraulic Machines” Laxmi Publications, 2006.
6. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.

NEE – 301: ELECTRO-MECHANICAL ENERGY CONVERSION –I

L T P 3 1 0

Unit – I

Principles of Electro-mechanical Energy Conversion- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque , Generated emf in machines; Torque in machines with cylindrical air gap. (7)

Unit – II

D.C. Machines- Construction of DC Machines, Armature winding, Emf and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C. generators. (9)

Unit –III

D.C. Machines (Contd.)- Performance characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test). (8)

Unit – IV

Single Phase Transformer- Phasor diagram, Efficiency and voltage regulation, All day efficiency.

Testing of Transformers- O.C. and S.C. tests, Sumpner's test, Polarity test.

Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits & demerits and applications. (8)

Unit – V

Three Phase Transformers - Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.(9)

Text Books:

1 I.J. Nagrath & D.P.Kothari, " Electrical Machines", Tata McGraw
Hill 2 Husain Ashfaq , " Electrical Machines", Dhanpat Rai & Sons
3 P.S.Bimbhra, "Electrical Machinery", Khanna Publisher
4. A.E. Fitggerald, C.Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

5 Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India. 6
M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
7 P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers

NEE-302: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L T P 3 1 0

UNIT I

(1) Philosophy of Measurement- Methods of measurement, Measurement system**,** Classification of instrument systems, Characteristics of instruments & measurement systems**,** Errors in measurement & its analysis, Standards. (4)

(2) Analog Measurement of Electrical Quantities- Electrodynamic, Thermocouple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynamic wattmeter, Three Phase wattmeter, Power in three phase systems, Errors & remedies in wattmeter and energy meter. (5)

UNIT II

Instrument Transformers:CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (8)

UNIT III

Measurement of Parameters- Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Q meter. (9)

UNIT IV

(1) AC Potentiometers- Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. (4)

(2) Magnetic Measurement- Ballistic galvanometer, Flux meter**,** Determination of hysteresis loop, measurement of iron losses**.** (4)

UNIT V

(1) Digital Measurement of Electrical Quantities- Concept of digital measurement, Block diagram, Study of digital voltmeter, Frequency meter, *Spectrum analyzer,* Electronic multimeter. (3)

(2) Cathode Ray Oscilloscope- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components**,** Applications of CRO in measurement, Lissajous Pattern, Dual trace & dual beam oscilloscopes. (3)

Text Book:

1. E. W. Golding & F. C. Widdis, “Electrical Measurement &Measuring Instrument”, A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, “Electrical & Electronic Measurement & Instrument”, Dhanpat Rai & Sons, India
3. Purkait, “Electrical & Electronics Measurement & Instrumentation”, TMH

Reference Books:

4. Forest K. Harris, “Electrical Measurement”, Willey Eastern Pvt. Ltd. India
5. M. B. Stout , “Basic Electrical Measurement”, Prentice Hall of India
6. W. D. Cooper, “Electronic Instrument & Measurement Technique”, Prentice Hall International
7. J. B. Gupta, “Electrical Measurement & Measuring Instrument”, S. K. Kataria & Sons

NEE-303- BASIC SYSTEM ANALYSIS

L T P 3 1 0

UNIT I

Introduction to Continuous Time Signals and Systems- Basic continuous time signals, Unit step, Unit ramp, Unit impulse and periodic signals with their mathematical representation and characteristics. *Inversion, Shifting and Scaling of signals,* Introduction to various types of systems, *Causal, Stable, Linear and Time invariant systems.*

Analogous System- Linear mechanical elements, Force-voltage and force-current analogy, Modeling of mechanical and electro-mechanical systems. (9)

UNIT II

Fourier Transform Analysis- Exponential form and *compact* trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis. (8)

UNIT III

Laplace Transform- Review of Laplace Transform, Initial and Final Value theorems, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to analysis of networks, Waveform synthesis and Laplace Transform of complex waveforms. (8)

UNIT IV

State – Variable Analysis- Introduction, State Space representation of linear systems, Transfer Function and State Variables, State Transition Matrix, Solution of State Equations for homogeneous and non-homogeneous systems, Applications of State-Variable technique to the analysis of linear systems. (8)

UNIT IV

Z-Transform Analysis- Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function. (7)

Text Books:

1. Oppenhiem, Wilsky, Nawab, “Signals & Systems”, PHI
2. M E Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
3. A. Anand Kumar, “ Signals & Systems”, PHI
4. Choudhary D. Roy, “Network & Systems”, Wiley Eastern Ltd.

Reference Books:

5. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
6. Donald E. Scott, “Introduction to circuit Analysis” Mc. Graw Hill
7. B. P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
8. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, “Singnals and Systems”, Tata Mc. Graw Hill, 2001.
9. Taan S. Elali & Mohd. A. Karim, “Continuous Signals and Systems with MATLAB” 2nd Edition, CRC Press.

NEC-409 : ANALOG AND DIGITAL ELECTRONICS

L T P
3 1 0

ANALOG ELECTRONICS:

UNIT-I:

Special Diodes-

LED, Varactor diode, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications. Transistors as a switch.

UNIT-II

Frequency Response:

Amplifier transfer function, low and high frequency response of common emitter and common source amplifiers.

Feedback:

General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.

UNIT-III:

Basic principle of sinusoidal oscillator, R-C Phase Shift and Wein Bridge oscillators, tuned oscillators- Collpits and Hartley; Crystal oscillator

DIGITAL ELECTRONICS:

UNIT-IV

Combinational Logic Circuits: Multiplexers/Demultiplexures, Encoders/Decoders.

Sequential Logic Circuits: latches, flip-flops- S-R, T, D, J-K.

Shift Registers: Basic principle, serial and parallel data transfer, shift left/right registers, universal shift register.

Counters: Mode N Counters, ripple counters, synchronous counters, ring/Johnson counters.

UNIT-V

OP-AMP applications - Astable, Monostable and Bistable multivibrators, Schmitt trigger, IC-555 Timer, A/D and D/A converters.

Voltage Regulators: Series, shunt and switching regulators, op-amp based configurations.

Memories: Introduction to ROM, RAM; Sequential Memory, Memory organization.

Text Books:

1. A.S. Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)
2. Malvino & Leach, “Digital Principles and applications” Tata Mc. Graw Hill
3. R.A. Gayakwad “Op amps and Linear Integrated Circuits” Prentice Hall of India.
4. Balbir Kumar and Shail B.Jain, “Electronic Devices and Circuits” Prentice Hall of India,2007

Reference Books:

1. Taub & Schilling “Digital Electronics”- Tata Mc Graw Hill
2. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits” Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, “Microelectronics” Mc Graw Hill
4. Anand Kumar, “Switching Theory and Logic Design” Prentice Hall of India, 2008.
5. Aloke. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

NEE-401: ELECTRO-MECHANICAL ENERGY CONVERSION - II

L T P 3 1 0

UNIT - I

Synchronous Machine I - Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests,

Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient. (9)

UNIT - II

Synchronous Machine II - Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor - Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser. (8)

UNIT - III

Three phase Induction Machine – I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque- slip characteristics, No load & blocked rotor tests, Efficiency, Induction generator & its applications. (9)

UNIT - IV

Three phase Induction Machine- II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit). (8)

UNIT - V

Single phase Induction Motor - Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor.

AC Commutator Motors - Universal motor, Single phase a.c. series compensated motor, Stepper motors. (8)

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain "Electric Machines", Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans "Electric Machinery", MC Graw Hill.
4. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers 6**.** M.G.Say, "Alternating Current Machines", Pitman & Sons

NEE- 402 NETWORK ANALYSIS AND SYNTHESIS

L T P 3 1 0

Unit – I

Graph Theory- Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analyses. (7)

Unit – II:

Network Theorems (Applications to AC Networks)- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem. (8)

Unit – III

Transient Circuit Analysis- Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. (7)

Unit – IV

Network Functions- *Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.* (3)

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation. (8)

Unit – V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (5)

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters. (4)

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. C. L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill
3. M. E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T. S. K. V. Iyer, "Circuit Theory", Tata McGraw Hill
5. Joseph A. Edminister, " Theory & Problems of Electric Circuits", McGraw Hill

NEE – 403: ELECTRICAL INSTRUMENTATION AND PROCESS CONTROL

L T P 2 1 0

Unit-I

Transducer – I

Definition, Advantages of electrical transducers, Classification, Characteristics, Factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT (7)

Unit-II

Transducer – II

Capacitive, Piezoelectric, Hall effect and Opto electronic transducers. Measurement of motion, force, pressure, temperature, flow and liquid level. (6)

Unit-III

Telemetry

General telemetry system, Land line & radio frequency telemetering systems, Transmission channels and media, Data receiver & transmitter.

Acquisition System

Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV

Display Devices and Recorders

Display devices, Storage oscilloscope, Spectrum analyzer, Strip chart & X-Y recorders, Magnetic tape & digital tape recorders.

Process Control

Principle, Elements of process control system, Process characteristics, Electronic, pneumatic & digital controllers. (7)

Text Books:

1. A. K. Sawhney, "Advanced Measurements & Instrumentation", Dhanpat Rai & Sons
2. B.C. Nakra & K.Chaudhry, "Instrumentation, Measurement and Analysis", Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, "Process Control Instrumentation Technology", Prentice Hall

Reference Books:

4. E. O. Decblin, "Measurement System – Application & design", Mc Graw Hill.
5. W. D. Cooper and A.P. Beltried, "Electronics Instrumentation and Measurement Techniques" Prentice Hall International
6. Rajendra Prasad, "Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, "Electronic Instruments and Instrumentation Technology" PHI Learning.

NEE-351: ELECTROMECHANICAL ENERGY CONVERSION- I LAB

L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1 To obtain magnetization characteristics of a d.c. shunt generator.

2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.

3 To obtain efficiency of a dc shunt machine using Swinburn's test.

4 To perform Hopkinson's test and determine losses and efficiency of DC machine.

5 To obtain speed-torque characteristics of a dc shunt motor.

6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control

7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/Static Ward –Leonard method.

8 To study polarity and ratio test of single phase and 3-phase transformers.

9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.

10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.

11 To obtain 3-phase to 2-phase conversion by Scott connection.

12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

College may add any two S/W based experiments in the above list.

NEE-352: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS LAB

L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin's double bridge.
6. Measurement of voltage, current and resistance using dc potentiometer.
7. Measurement of inductance by Maxwell's bridge.
8. Measurement of inductance by Hay's bridge.
9. Measurement of inductance by Anderson's bridge.
10. Measurement of capacitance by Owen's bridge.
11. Measurement of capacitance by De Sauty bridge.
12. Measurement of capacitance by Schering bridge.
13. Study of frequency and differential time counter.

College may add any two experiments in the above list.

NEE-353: NUMERICAL TECHNIQUE LAB

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list:

S/W Based Experiments using MATLAB or Equivalent software.

1. Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
6. Solution of differential equations using 4th order Runge-Kutta method.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.
9. Determination of time response of an R-L-C circuit.

College may add any three experiments in the above list.

NME-359 : Thermal & Hydraulic M/c Lab **L : T : P::0 : 0 : 3**

Experiments : Minimum 10 experiments out of following:

1. Study and working of Two stroke petrol Engine
2. Study and working of Four stroke petrol Engine
3. Study and working of two stroke Diesel Engine
4. Study and working of four stroke Diesel Engine.
5. Study of compounding of steam turbine
6. Study of Impulse & Reaction turbine
7. Impact of Jet experiment.
8. Turbine experiment on Pelton wheel.
9. Turbine experiment on Francis turbine.
10. Turbine experiment on Kaplan turbine.
11. Experiment on Reciprocating pump.
12. Experiment on centrifugal pump.

NEE- 451: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY

L T P 0 0 3

Note: Minimum eight experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method.

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

NEE-452: NETWORK LABORATORY

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.
11. Determination of frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.

College may add any three S/W based experiments in the above list.

NEE – 453: ELECTRICAL INSTRUMENTATION LAB.

L T P 0 0 2

Minimum eight experiments are to be performed from the following list.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer

College may add any three S/W based experiments in the above list.

NEC-459 ELECTRONICS LAB

L T P 0 0 2

ANALOG ELECTRONICS:

Note: Select at least any four out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any four out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Electrical and Electronics Engineering

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Third Year

Semester-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501	Elements Of Power System	3	1	0	30	20	50	100	150	4
2	NEE 502	Power Electronics	3	1	0	30	20	50	100	150	4
3	NEE-503	Control System	3	1	0	30	20	50	100	150	4
4	NEE-504	Microprocessor & Its Applications	3	1	0	30	20	50	100	150	4
5	NEC-508	Fundamentals of E.M. Theory	2	1	0	15	10	25	50	75	3
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551	Power Electronics Lab	0	0	3	10	10	20	30	50	1
8	NEE 552	Control System Lab	0	0	3	10	10	20	30	50	1
9	NEE-553	Microprocessor Lab	0	0	2	10	10	20	30	50	1
10	NEE 554	Simulation Based Minor Project	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	1
		TOTAL	16	5	10					1000	26

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Third Year

Semester-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601	Power System Analysis	3	1	0	30	20	50	100	150	4
2	NEE 602	Switchgear & Protection	3	1	0	30	20	50	100	150	4
3	NEN-603/ NEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
4	NEN-011-NEN-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
5	NEN-021-NEN-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEC-651	IC Lab	0	0	2	10	10	20	30	50	1
8	NEN-652	Electrical & Electronics CAD Lab	0	0	3	10	10	20	30	50	1
9	NEN-653	Minor Project	0	0	2	10	10	20	30	50	1
10	NEN- 654	Seminar	0	0	3		50	50		50	1
11	NGP-601	GP						50		50	1
		TOTAL	16	5	10					1000	26

Elective-I

NEN – 011: Digital Control System
NEN – 012: Fundamentals of Digital Signal Processing
NEN – 013: Neural Networks and Fuzzy System
NEN – 014: Special Electrical Machine

Elective-II

NEN – 021: VLSI Design
NEN – 022: Wireless Communication
NEN – 023: Antenna and Wave Propagation
NEN – 024: Mechatronics

Annexure-III

NEE-501: ELEMENTS OF POWER SYSTEM

L T P
3 1 0

Unit-I

Power System Components:

Single line Diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System

Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:

Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.Proximity effect

Unit-II

Over Head Transmission Lines

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

Unit-III

Corona and Interference:

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

Unit-IV

Mechanical Design of transmission line:

Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables:

Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit-V

Neutral grounding:

Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line:

Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission:

Introduction to EHV AC and HVDC transmission lines.

Text Books

1.W. D. Stevenson, “Element of Power System Analysis”, McGraw Hill,

2.C. L. Wadhwa, “Electrical Power Systems” New age international Ltd. Third Edition

3.Asfaq Hussain, “'Power System”, CBS Publishers and Distributors,

4.B. R. Gupta, “Power System Analysis and Design” Third Edition, S. Chand & Co.

5.M. V. Deshpande, “Electrical Power System Design” Tata Mc Graw Hill.

Reference Books

6.Soni, Gupta & Bhatnagar, “A Course in Electrical Power”, Dhanpat Rai & sons,

8.S.N.Singh, “ Electric Power Generation, Transmission& distribution.” PHI Learning

NEE-502:POWER ELECTRONICS

L T P
3 1 0

Unit-I

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics, specifications of switches, types of power electronic circuits, Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT

Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC

Unit-II

Power Semiconductor Devices (Contd.)

Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers and their various applications.

Unit-III

Phase Controlled Converters

Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters. Performance Parameters

Three phase half wave converters, three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls

Single phase ac voltage controller with resistive and inductive loads

Three phase ac voltage controllers (various configurations and comparison only)

Single phase transformer taps changer, industrial applications.

Cyclo Converters

Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation and their applications.

Unit-V

Inverters

Single phase series resonant inverter,Single phase bridge inverters,Three phase bridge inverters

Voltage control of inverters,Harmonics reduction techniques,Single phase and three phase current source inverters

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005
3. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press.

Reference Books:

4. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics &Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008.
7. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

NEE-503: CONTROL SYSTEM

L T P
3 1 0

Unit-I

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit-II

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit-III

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor

Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique:

The root locus concepts, construction of root loci

Unit-IV

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain:

Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles

Unit-V

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:

Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, " Control Systems theory and Applications", Pearson Education

NEE-504: MICROPROCESSORS

L T P
3 1 0

UNIT-I:

Introduction to Digital Computer and Microprocessor:

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II:

8-bit Microprocessors.

8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III:

16-bit Microprocessors: Architecture:

Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes**:** Instruction format:

Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types.

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V

Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter.

8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications with the 8085" Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, "Microcomputers and Microprocessors" PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing" Tata Mc. Graw Hill.

4. Krishna Kant, “Microprocessors and Microcontrollers” PHI Learning.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata McGraw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. N. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford University Press.
11. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family” Prentice Hall (India)

NEC-508: FUNDAMENTALS OF E.M.THEORY

L T P
2 1 0

Unit I
Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation,divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density,Energy and potential.

Unit-II
Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations.

Unit-III
Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

Unit-IV
Uniform Plane waves, Plane wave reflection and dispersion

Text Books:

1. Hayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata McGraw Hill Publishing
2. Mathew Sadiku, "Electromagnetic Field Theory", Oxford University Press.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
4. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition.
5. Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition

NEE-551: POWER ELECTRONICS LABORATORY

L T P
0 0 3

Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.
17.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” Prentice hall Inc.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media,

NEE– 552: CONTROL SYSTEM LABORATORY

L T P
0 0 2

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

10. To simulate PID controller for transportation lag.
11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

NEE-553: MICROPROCESSOR LABORATORY

L T P
0 0 2

A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

NEE-601: POWER SYSTEM ANALYSIS

L T P
3 1 0

Unit-I

Representation of Power System Components:

Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II

Symmetrical fault analysis:

Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unsymmetrical faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations

Unit-III Load Flows:

Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations,

load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV

Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Unit-V Traveling Waves:

Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

NEE – 602: SWITCHGEAR AND PROTECTION

L T P
3 1 0

Unit I:

Introduction to Protection System:

Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

Unit-II:

Relay Application and Characteristics:

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:

Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III

Protection of Transmission Line:

Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

Unit-IV:

Circuit Breaking:

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:

Classification, testing station and equipments, testing procedure, direct and indirect testing

Unit-V

Apparatus Protection:

Protection of Transformer, generator and motor.

Circuit Breaker:

Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, “Fundamentals of Power System Protection”, Prentice Hall of India.
5. T.S.M Rao,“Power System Protection: Static Relays with Microprocessor Applications” Tata Macgraw Hill”.
6. A.R. Van C. Warringtaon , “ Protective Relays- Their Theory and Practice, Vol. I & II” Jhon Willey & Sons.

NEN-603/EEC 501: Integrated Circuits

L T P
3 1 0

EEC 501 INTEGRATED CIRCUITS

Unit-I

Analog Integrated circuit Design: an overview: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror.

The 741 IC Op-Amp: Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR. **8**

Unit-II

Linear Applications of IC op-amps: An Overview of Op-Amp (ideal and non ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors.

Filters: First and second order LP, HP, BP BS and All pass active filters, KHN, Tow-Thomas and State Variable Biquad filters; Sinusoidal oscillators. **8**

Unit-III

Digital Integrated Circuit Design-An Overview: CMOS Logic Gate Circuits: Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates.

Latches and Flip flops: The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits. **8**

Unit-IV

Non-Linear applications of IC Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multivibrator, Monostable multivibrator, Generation of Triangular Waveforms. **8**

Unit-V

D/A and A/D converters Integrated Circuit Timer: The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator Using the 555 IC.

Phase locked loops (PLL): Ex-OR Gates and multipliers as phase detectors, Block Diagram of IC PLL, Working of PLL and Applications of PLL. **8**

Text Book:

[1] Sedra and Smith, “Microelectronic Circuits”, Oxford University Press.

Reference Books:

[2] Michael Jacob, `Applications and Design with Analog Integrated Circuits’, PHI, 2006.
[3] Jacob Milliman and Arvin Grabel, “Microelectronics”, TMH, 2008.

DEPARTMENTAL ELECTIVES

ELECTIVE – I

NEE – 011/NEN-011: Digital Control System

L T P
3 1 0

UNIT-I

Signal Processing in Digital Control:

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample- hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II

Design of Digital Control Algorithms:

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

UNIT-III

State Space Analysis and Design:

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

UNIT-IV

Stability of Discrete System:

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

UNIT-V

Optimal digital control :

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System",Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems:Theory, hardware, Software",Mc Graw Hill.

NEE – 012/NEN-012: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

L T P
3 1 0

Unit-I

Discrete-Time Signals And Systems:

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Discrete Fourier Transform:

Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit-II

Sampling of Continuous Time Signals:

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III

Transform Analysis of LTI Systems:

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase

Overview of finite precision numerical effects, effects of coefficient quantization,Effects of round-off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

Unit-IV

Filter Design Techniques:

Design of D-T IIR filters from continuous – time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation

Unit-V

Efficient computation of the DFT:

Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier Analysis of Signals Using DFT :

DFT analysis of sinusoidal signals, time-dependent Fourier transforms: Block convolution, Fourier analysis of non – stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. & Manolakis, D.G.,” Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall of India.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, Prentice Hall of India.
5. Oppenheim, Alan V. & Willsky, Alan S. , “Signals and Systems” , Prentice Hall of India, 2nd Edition
6. Johnson, J.R. , “Introduction to Digital Signal Processing”, Prentice Hall of India.

NEE – 013/NEN-013: NEURAL NETWORKS AND FUZZY SYSTEM

L T P
3 1 0

Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule,
Auto-associative and hetro-associative memory

Unit-II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.

Reference Books:

3. Siman Haykin, “Neural Netowrks” Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

NEE-603/NEN -014: SPECIAL ELECTRICAL MACHINE

L T P

3 1 0

UNIT-I

Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power)

UNIT-II

Single phase Induction Motors:

Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor-start capacitor-run and shaded pole motors.

Two Phase AC Servomotors:

Construction, torque-speed characteristics, performance and applications.

UNIT-III Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:

Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT-IV

Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V

Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “ Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001
3. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987
5. M.G. Say “ Alternating current Machines” Pitman & Sons .

DEPARTMENTAL ELECTIVES
ELECTIVE – II

NEN-021 : VLSI DESIGN

L T P
2 1 0

UNIT-I

Introduction to integrated circuit technology. CMOS fabrication, the p-well process, n-well process, twin tub process. Bi-CMOS technology. Basic electrical properties of MOS circuits, Ids-Vds relationship, MOS transistor threshed voltage Vt, Transconductance and output conductance, MOS transistor figure of merit.

UNIT-II

The n-MOS inverter, pull-up to pull-down ratio, CMOS inverter and its characteristics, latch –up in CMOS circuits, stick diagrams, n-MOS design style,CMOS design style, lambda based design rules , Body effect, sheet resistance,capacitances of layers, Gate delays, Delay estimation, logical efforts, Scaling modelsand scaling factors, limitation of scaling, , Limits of miniaturization.

UNIT-III

n-MOS, CMOS NAND Gates, n-MOS, CMOS NOR gates. Combinational circuit design, sequential circuit design, design considerations, problems associated with VLSI Design, Design Methodology and Tools, Standard Cell Based Design, Design Flows, Automated Layout Generation, Placement, Floor planning, Routing, Parasitic Extraction, Timing Analyses.

UNIT-IV

Full Custom Design, Semi Custom Design, Programmable Logic structures, Field Programmable Gate arrays (FPGA) , Configurable Logic Block (CLB), Application-Specific Integrated Circuits (ASICs)

UNIT-V

Design for Testability, Faults types and Models, Controllability and Observability, AD HOC Design Techniques, Scan-Based Techniques, Built-In self Test (BIST),Techniques, Current Monitoring IDDQ Test. Packaging, Package Parasitic, Heat dissipation, Design Economics, Parametric yield.

Text Books:

1. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Prentice-Hall of India.
2. CMOS VLSI Design, A Circuits and Systems Perspective by Neil H.E. Weste, David Harris, Ayan Banerjee, Pearson Education.
3. CMOS Digital Integrated Circuits Analysis and Design by Sung-Mo Kang, Yusuf Leblebici. Tata Mc-Graw-Hill.

References:

4. Digital Integrated Circuits A Design Perspective by Jab M. Rabaey, Anantha Chandra kasan, Borivoje Nikolic, Prentice-Hall of India Pvt. Limited.
5. Principles of C-MOS VLSI Design A systems Perspective by Neil H.E. Weste, Kamrau Eshraghian, Pearson Education
6. Application-Specific Integrated Circuits by Michal John Sebastian smith, Pearson Education..

NEN -022: WIRELESS COMMUNICATION

L T P
2 1 0

Unit-I
Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design usingpath loss model. Small scale fading & multi-path propagation and measurements, impulse response model and parameters of multi-path channels, types of fading, theory of multi-path shape factor for fading wireless channels.

Unit-II
Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FH-SS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multi-path channels,fundamentals of equalization, equalizer in communication receiver, survey of equalization techniques, linear equalizer, linear equalizer, non-linear equalizations, diversity techniques,RAKE receiver.

Unit-III
Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, time division multiple access, space division multiple access, and frequency division multiple access.

Unit-IV
Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.

Text Book:
1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson

Reference Books:
1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin S & Moher M., “Modern wireless communication”, Pearson, 2005
4. R. Pandya, “ Mobile and personal communication system”, PHI.

NEN -023 ANTENA AND WAVE PROPOGATION

L T P
2 1 0

UNIT-I

Antena Principles: Potential functions & Electromagnetic field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance.
Network Theorems
Directional Properties of Dipole Antenna.
Antenna Gain, Effective Area, Antenna Terminal impedance, Practical Antennas and Methods of Excitation, Antenna Temperature and Signal. To Noise Ratio.

UNIT-II

Antenna Arrays: Two Element Array, Horizontal Patterns in Broadcast Arrays, Linear Arrays, Multiplication of Patterns, effect of the earth on vertical patterns, Binomial array.

UNIT-III

Wave Propagation: Modes of Propagation, Plane Earth Reflection. Space
wave and Surface Wave, Reflection and refraction waves by the lonosphere Tropospheric Wave.
Ionosphere Wave Propagation in the Inosphere , Virtual Height , MUF Critical frequency, Skip Distance, Duct Propagation, Space wave.

UNIT-IV

Practical Antenas:
VLF and LF tranmitting antennas, effect of antenna height, Field of short dipole, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, Directivity of Circular loop antenna with uniform current, Yagi-Uda array: Square corner yagi-uda hybride, circular polarization
Rhombic Antenna Weight and Leg length
Parabolic Reflectors Properties, Comparison with corner reflectors
Horn Antenna: Length and Aperture.
Introduction to Turstile Antenna
Effect of ground on antenna performance.
Broadband Antenna: Frequency independent concept, RUMSEY'Ss Principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral Antenna.

Text Books:

1. Jordan Edwards C. and Balmain Keith G./ "Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)
2. Kraus, JohnD & Mashefka, Ronald J. / "Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.

Reference Books:

1. Prasad, K.D./ "Antennas and Wave Propagation" /Khanna Publications.
2. Collin, R./ "Antennas and Radiowave Propagation" /Tata McGraw-Hill
3. Hayt Jr. William H./ "Engineering Electromagnetics"/Tata McGraw-Hill.
4. Das, Annaparna & Das, Sisir K. / "Microwave Engineering"/Tata McGraw Hill.
5. Roy, Sitesh Kumar & Mitra, Monojit / "Microwave Semiconductor Devices" / Prentice Hall (India).

NEN -024: MECHATRONICS

L T P
2 1 0

1. Mechatronics and its scope:
Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level. Signal conditioning amplification, filtering & data acquisition.

2. Pneumatic and Hydraulic actuation systems:
Directional control valves, pressure control valves and cylinders. process control valves. Mechanical
actuation system-kinematic chains, cams, gear trains. Ratchet & Pawl, dampers, bearings. Electrical actuation system. Mechanical switches- solenoid operated solid state switches, DC, AC & stepper motors.
Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.

3. Elements of Microprocessors & Microcontrollers, Programmable **logic controllers &** Communication
interface.

4. Case Studies of Mechatronic Systems:
Industrial Robot and its control
Automobile Engine Control
Electromechanical disc-control.

5. Vehicle suspension Control:
Micro mechanical systems. Computer Printer, VCR, Fax Machine, NC Machine.

References:
1. Rolf Isennann, " Mechatronics Systems", Springer, 2005.
2. W. Bolten, "Mechatronics", Pearson Education 2003.
3. HMT Ltd, "Mechatronics:, Tata McGraw Hill 1998.

NEC– 651: IC LAB

L T P
0 0 3

INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for:
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostable multivibrator using IC 555.

NEN=652: ELECTRICAL and ELECTRONICS CAD LAB

L	T	P
0	0	3

1. Design of Single phase transformer.
2. Design of Single phase Induction Motor.
3. Design of DC motor.
4. Design of DC generator.
5. Design of Single phase alternator.
6. Design of Synchronous Motor.
7. Design of lag, lead and lag-lead compensator.
8. Design of PI & PD Controller.
9. Design of PID controller.
10. Design of Analog Filter
11. Design of Self-tuned filter.
12. Design of voltage controller Oscillator
13. Design of DC-DC converter.

Text Books:-

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.

Dr. APJ ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Fourth Year **Semester-VII**

S.NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEN701	ELECTRIC DRIVES	3	1	0	30	20	50	100	150	4
2	NEN702	POWER STATION PRACTICE	3	1	0	30	20	50	100	150	4
3	NEC702A	ANALOG & DIGITAL COMMUNICATION	3	1	0	30	20	50	100	150	4
4	NEN031 to 033, NCS039	DEPARTMENTAL ELECTIVE-III	3	1	0	30	20	50	100	150	4
5	NOE071 to 074	OPEN ELECTIVE-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
6	NEN751	POWER SYSTEM LAB	0	0	3	10	10	20	30	50	1
7	NEC752B	ADC LAB	0	0	3	10	10	20	30	50	1
8	NEN753	INDUSTRIAL TRAINING	0	0	2	30	20	50	--	50	1
9	NEN754	PROJECT	0	0	2	30	20	50	--	50	1
10	NGP701	GP					50	50		50	1
		TOTAL	16	5	10					1000	24

LIST OF DEPARTMENTAL ELECTIVE-III

NEN-031 POWER SYSTEM OPERATION AND CONTROL
NEN-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEN-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I

NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATIONS RESEARACH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY

PROPOSED STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Fourth Year **Semester-VIII**

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE801	ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS	3	1	0	30	20	50	100	150	3
2	NEC802	EMBEDDED SYSTEM	3	1	0	30	20	50	100	150	4
3	NEE041 to 042; NEN043 to 044	DEPARTMENTAL ELECTIVE-IV	3	1	0	30	20	50	100	150	4
4	NOE081 to 082; NOE084 to 085	OPEN ELECTIVE-2	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEN851	PROJECT	0	0	12	0	100	100	250	350	8
6	NGP801	GP					50	50		50	1
		TOTAL	14	5	12		180	350	650	1000	24

LIST OF DEPARTMENTAL ELECTIVE IV

NEE041 EHVAC&DC TRANSMISSION
NEE042 POWER QUALITY
NEN043 IMAGE PROCESSING
NEN044 SATELLITE COMMUNICATION

LIST OF OPEN ELECTIVE 2

NOE081 NON-CONVENTIONAL ENERGY RESOURCES
NOE082 NON LINEAR DYNAMIC SYSTEMS
NOE084 AUTOMATION & ROBOTICS
NOE085 DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

NEE701/NEN 701: Electric Drives

L T P
3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation

Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited DC motor drives (continuous conduction only), dual converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited DC motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive:

Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor:

Self controlled scheme

Special Drives:

Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K. Pillai, “A First Course on Electric Drives”, New Age International.
3. B.N. Sarkar, “Fundamental of Industrial Drives”, Prentice Hall of India Ltd.

Reference Books:

1 M. Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V. Subrahmanyam, “Electric Drives: Concepts and Applications”, TataMcGraw Hill.

NEE 702/NEN702: POWER STATION PRACTICE

L T P
3 1 0

UNIT-I:Introduction: Electric energy demand and growth in India, electric energy sources.
Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.
Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.
Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.
Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.
Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V:Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:
1. B.R. Gupta, “Generation of Electrical Energy”, S. Chand Publication.
2. Soni, Gupta & Bhatnagar, “A text book on Power System Engg.”, Dhanpat Rai & Co.
3. P.S.R. Murthy, “Operation and control of Power System” BS Publications, Hyderabad.

Reference Books:
4. W. D. Stevenson, “Elements of Power System Analysis”, McGraw Hill.
5. S. L. Uppal, “Electrical Power”, Khanna Publishers.

NEC702A: Analog & Digital Communication

L T P
3 1 0

UNIT I:
Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:
Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:
Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:
Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:
Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:
1. Simon Haykin," Communication Systems" John Wiley & Sons 4th Edition
2. G.Kennedy and B. Davis," Electronic Communication Systems" 4th Edition, Tata McGraw Hill
3. Simon Haykin, "Digital Communications" John Wiley & Sons
4. T.L. Singal, "Analog & Digital Communication", Tata Mc Graw Hill

Reference Books:
1. B.P. Lathi, "Modern Analog & Digital Communication Systems" Oxford University Press.
2. Taub & Schilling, "Communication System: Analog and Digital" Tata Mc Graw Hill
3. R.P. Singh & S.D. Sapre, "Communication Systems Analog and Digital" Tata McGraw Hill.

NEE –031/NEN-031: POWER SYSTEM OPERATION AND CONTROL

L T P
3 1 0

UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
1. D.P. Kothari & I.J. Nagrath, “Modern Power System Analysis” Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, “Operation and control in Power Systems” B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, “ Understanding FACTs” Concepts and Technology of Flexible AC Transmission Systems”
4. A. J. Wood & B.F. Wollenburg, “ Power Generation, Operation and Control “ John Wiley & Sons.
Reference Books:
1. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
2. P. Kundur, “ Power System Stability and Control Mc Graw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza,’ Power System Analysis’ Oxford University Press.

NEE-032/NEN032:
ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P
3 1 0

Unit-I: Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.
16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:
1. Ray, A.K. & Burchandi, K.m., "Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing" Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, "Advanced Microprocessors and Microcontrollers" New Age International.
3. Krishna Kant,"Microprocessors and Microcontrollers" PHI Learning.
4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.

Reference Books:
1. Ayala, "The 8051 Micro Controller", Centage Learning.
2. Mazidi M.A., Maizidi J.G. Mckinlay R.D., "The 8051 Microcontroller and Embedded Systems" Pearson Education.
3. Rajkamal, "The concept and feature of microcontrollers 68HC11, 8051 and 8096", S.Chand Publisher, New Delhi
4. Peatman John, "Design with microcontroller", Mc.-Graw Hill Publishing.

NEE033/NEN-033: FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications
Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications
Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV: Voltage Source Converter Based Facts Controllers
Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability. SSSC-operation of SSSC and the control of power flow – modelling of SSSC in load flow and transient stability studies.

TEXT BOOKS:
1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor – Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:
1. A.T. John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE) 1999.
2. V.K. Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System: Modelling and Control" Springer, 2012.

NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

L T P
3 1 0

Unit-I
Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II
Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III
Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV
Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation. Translating object oriented design into implementations.

Unit-V:
Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

Text Books:
1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das “Unix concepts & application” TMH

Reference Books:
1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis.

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication.

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

NEN – 751: POWER SYSTEM LAB

L T P
0 0 3

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

(B) Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata McGraw Hill.
2. T.K. Nagsarskar & M.S. Sukhija, Power System Analysis’ Oxford University Press.

NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

L T P
0 0 2

Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.

NEE801: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

L T P
3 1 0

UNIT – I

Crystal Structure of Materials:

A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth

B. Energy bands in solids, classification of materials using energy band.

UNIT – II

Conductivity of Metals:

Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III

Mechanism of Conduction in semiconductor materials:

Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV

Magnetic Properties of Material:

Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :

1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S. Chand & Co.

References :

1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2 Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
4 T. K. Basak, "Electrical Engineering Materials" New age International.

NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:
1. H.Kopetz, “Real-Time Systems”, Kluwer
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

NEE – 041: EHV AC & DC TRANSMISSION

L T P
3 1 0

UNIT-I:Introduction :
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:EHV AC Transmission :
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.
Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters,
Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :
1.R. D. Begamudre, “Extra High Voltage AC Transmission Engineering” Wiley Eastern.
2.K. R. Padiyar, “HVDC Power Transmission Systems: Technology and System Reactions” New Age International.
3.J. Arrillaga,“ High Voltage Direct current Transmission” IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, “High Voltage Engineering” Tata Mc Graw Hill.
Reference Books:
5.M. H. Rashid , “ Power Electronics : Circuits, Devices and Applications” Prentice Hall of India.
6.S. Rao, “EHV AC and HVDC Transmission Engineering and Practice” Khanna Publisher.
7.“EPRI, Transmission Line Reference Book, 345 KV and above” Electric Power Research Institute. Palo Alto, California, 1982.

NEE-042: POWER QUALITY

L T P
3 1 0

Unit-I

Introduction to Power Quality:

Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations**.**

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices-Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “ Power Quality” CRC Press.

NEN -043: IMAGE PROCESSING

L T P
3 1 0

UNIT-I

Image:

Image formation, image geometry perspective and other transformation, sterio imaging elements of visual perception Digital Image-sampling and quantization serial & parallel Image processing

UNIT-II

Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their properties, filters, correlators and convolvers Image enhancement-Contrast modification, Histogram specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour enhancement

UNIT-III

Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.

UNIT-IV

Segmentation Techniques-thresholding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications

UNIT-V

Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, skelton detection, Hough transform, topological and texture analysis, shape matching.
Practical Applications – Finger print classification, signature verification, text recognition, map understanding, bio-logical cell classificaton.

Text Books:

1. Ganzalez and Wood, “Digital Image Processing”, Addison Wesley, 1993.
2. Anil K.Jain, “Fundamental of Image Processing”, Prentice Hall of India

References:

1. Rosenfeld and Kak, “Digital Picture Processing” vol. I & vol. II, Academic,1982
2. Ballard and Brown, “Computer Vision”, Prentice Hall, 1982
3. Wayne Niblack, “An Introduction to Digital Image Processing”, Prentice Hall, 1986
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publications.

NEN-044 : SATELLITE COMMUNICATION

L T P
3 1 0

UNIT-I
Elements of Satellite Communication Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

UNIT-II
Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

UNIT-III
Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM. Multiple access: FDMA, TDMA, DAMA and CDMA.

UNIT-IV
Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolutional codes, linear and cyclic block codes. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.

UNIT-V
Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.

Text Books:
1. Satellite Communications / Pratt, Bostian, Allnutt / John Wiley & Sons.
2. Satellite Communications / Dennis Roddy / McGraw-Hill
3. Digital Satellite Communications/ Tri T. Ha./ McGraw-Hill.

OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I :Introduction : Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II :Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III :Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV :Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V :Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations.
Waste Recycling Plants.

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford University Press.

NOE-082: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity. Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos.

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” McGraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automation” Wily Eastern.

NOE-085: DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

L T P
3 1 0

Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, data definitions language, DML, overall database structure.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV: Foundation. Introduction to DATA Warehousing. Client / Server Computing model & Data Warehousing. Parallel processors & System. Distributed DBMS implementations. Client /Server RDBMS Solutions.

Unit-V: DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools. Metadata.

Data Mining: Introduction to data mining

Text Books:

1. Korth, Silbertz, Sudarshan, Database Concepts., Mc Graw Hill
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.
4. Mallach, Data Warehousing System., Mc. Graw Hill

Reference Books :

1. Elmasri, Navathe, Fundamentals of Database Systems., Addition Wesley
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
3. Majumdar & Bhattacharya, Database Management System., Tata Mc Graw Hill
4. Ramakrishnan, Gehrke, Database Management System., Mc Graw Hill.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

for

B.TECH. INFORMATION TECHNOLOGY
of

Second Year

(Effective from the Session: 2014-15)

B.TECH INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC-309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS-301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS-302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS-303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	EHU-402/ EHU -401	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
3	NEC-408	Information Theory and Coding	3	1	0	30	20	50	100	150	4
4	NCS- 401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS- 402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NIT-401	Multimedia and Animation	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NCS-451	Operating System Lab	0	0	3	10	10	20	30	50	1
8	NIT-451	Multimedia and Animation Lab	0	0	3	10	10	20	30	50	1
9	NCS-455	Functional and Logic Programming Lab	0	0	3	10	10	20	30	50	1
10	NIT-456	Colloquium	0	0	3	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I

Digital Design and Binary Numbers:

Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.

Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).

Unit-II

Combinational Logic:

Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic

Unit-III

Memory and Programmable Logic Devices:

Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.

Unit-IV

Synchronous Sequential Logic:

Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.

Unit-V

Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT)

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition,Generalized Linked List .

Unit – II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion,Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit – III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, CompleteBinary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit – IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component,

Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks
Unit – V
Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.
Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .
Hashing: Hash Function, Collision Resolution Strategies
Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.
8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.
10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.
Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms , Definition and elementary properties of Rings and Fields, Integers Modulo n.
Unit-III
Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits
Unit-IV
Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.
Unit-V
Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to

Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India.

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**

  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability

  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**

  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series

  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**

  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation

  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**

  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence

  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method

  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

  Recommended Books:

  - *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
  - *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
  - *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.

5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi , Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects

4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC-408: INFORMATION THEORY AND CODING

Unit I
Review of probability theory, Definition of Information Measure and Entropy: Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source, Mutual information. Asymptotic Properties of Entropy and Problem Solving in Entropy
Unit – II
Block Code and its Properties, Data compression, Kraft-Mcmillan Equality and Compact Codes, Encoding of the source output, Shannon's encoding algorithm, Coding Strategies, Huffman Coding, Shannon-Fano-Elias Coding and Introduction to Arithmetic Coding.
Unit – III
Introduction to Information Channels, Communication Channels, Discrete communication channels, Continuous channels. Discrete memory less Channels, Mutual information, Channel Capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.
Unit – IV
Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding
Unit – V
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. Convolution Codes, Time domain approach. Transform domain approach.

Reference:

1.K. Sam Shanmugam, "Digital and analog communication systems", John Wiley.
2.Simon Haykin, "Digital communication", John Wiley.
3.Ranjan Bose, "ITC and Cryptography" ,Tata McGraw-Hill.
4. Thomas M. Cover, Joy A. Thomas ," Elements of Information Theory, 2nd Edition", Wiley Publication.
5. Roberto Togneri, Christopher J.S deSilva **"**Fundamentals of Information Theory and Coding Design**"**, CRC Press.
6. Steven Roman," Introduction to Coding and Information Theory**"**, Springer New York.
7. Glover and Grant, "Digital Communications", Pearson Education.

NCS-401: OPERATING SYSTEM

Unit – I
Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel
Systems.
Unit – II
Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process
generation.
Unit – III
CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.
Unit – IV
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation,

Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality
of reference.
Unit – V
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References :

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. SibsankarHalder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
5. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
1. Stuart E. Madnick & John J. *Donovan, " Operating Systems"*, Tata McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I
Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem
Unit – II
Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine,
Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
Unit – III
Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF
and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.
Unit – IV
Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA
Unit – V
Turing machines (TM): Basic model, definition and representation, Instantaneous Description,
Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory .

References :

1. Hopcroft, Ullman, "Introduction to Automata Theory,Languages and Computation", Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.
5. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation,

Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NIT-401: MULTIMEDIA AND ANIMATION

Unit I – Introduction:
Introduction to Multimedia and animation, Multimedia Systems, Design Fundamentals, Elements of multimedia and animation and their use, Back ground of Art, Color theory overview, Sketching & illustration, Storyboarding, different tools for animation .
Unit- 2 – Multimedia Projects:
Multimedia Skills, Hardware, Use of Graphics in Multimedia, Overview of Vector and Raster Graphics, Basic software tools, Multimedia Authoring Tools, Planning and Costing, Designing and Producing, Contents and talent, Delivering, Enhancing and Testing Multimedia Projects.
Unit-3 – Tools of Multimedia:
Paint and Draw Applications, Graphic effects and techniques, Image File Format, Anti-aliasing, Morphing, Multimedia Authoring tools, professional development tools.
Unit-4 - Animation:
Introduction and Principles of Animations, Power of Motion, Animation Techniques, Animation File Format, Making animation for Rolling Ball, making animation for a Bouncing Ball, Animation for the web, GIF, Plug-ins and Players, Animation tools for World Wide Web.

References:
1. Tay Vaughan, “Multimedia, Making IT Work”,Tata McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Sleinreitz, “Multimedia System”, Addison Wesley.
4. Ze-Nian Li and Mark S.Drew, “Fundamentals of Multimedia”, Pearson Education.
5.Prabhat K Andleigh, Kiran Thakrar, “Multimedia systems design”, PHI Learning Private Limited, Delhi India.
6.Elsom Cook – “Principles of Interactive Multimedia” ,Tata McGraw Hill.

NCS-451: OPERATING SYSTEM LAB

1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NIT-451: MULTIMEDIA AND ANIMATION LAB

1. Procedure to create an animation to represent the growing moon.
2. Procedure to create an animation to indicate a ball bouncing on steps.
3. Procedure to simulate movement of a cloud.
4. Procedure to draw the fan blades and to give proper animation.
5. Procedure to display the background given (filename: tulip.jpg) through your name.
6. Procedure to display the background given (filename: garden.jpg) through your name using mask.

7. Procedure to create an animation with the following features.
   WELCOME (Letters should appear one by one .The fill color of the text should change to a different colour after the display of the full word.)
8. Procedure to simulate a ball hitting another ball.
9. Procedure to design a visiting card containing at least one graphic and text information.
10. Procedure to take a photographic image. Give a title for the image. Put the border. Write your names. Write the name of institution and place.
11. Procedure to prepare a cover page for the book in your subject area. Plan your own design.
12. Procedure to extract the flower only from given photographic image and organize it on a background. Selecting your own background for organization.
13. Procedure to change a circle into a square using flash.
14. Procedure to display the background given (FILENAME: GARDEN.JPG) through your name using mask.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML or F# for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)
    -

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Information Technology

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NIT 501	Management Information System	2	1	0	15	10	25	50	75	3
6	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language Lab	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NIT 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NIT 061: Information Retrieval and Management
2. NIT 062: Modeling & Simulation
3. NIT 063: Bioinformatics
4. NIT 064: Knowledge based & decision Support System
5. NIT 065: Geographic Information System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 070: Human Computer Interface
3. NIT 066: E-Business Strategies
4. NCS 067: Distributed Database
5. NIT 067: Big Data

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures*:*** Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.

2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.

3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997

4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.

5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.

6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date
C J, " An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin
C. Desai, " An Introduction to Database Systems", Gagotia Publications 3.
Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NIT 501 MANAGEMENT INFORMATION SYSTEMS		2 1 0
Unit	Topic	Proposed Lectures
I	**Foundation of Information Systems**: Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.	8
II	**An overview of Management Information Systems**: Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Concept of an MIS,Structure of a Management information system.	8
III	**Concepts of planning**: Concept of organizational planning, The Planning Process, Computational support for planning. Business applications of information technology: Internet & electronic commerce and its applications Enterprise Solutions, Information System for Business Operations(SDLC),Information System for Strategic Advantage,Decision Support Systems and its benefits and characterstics.	8
IV	**Managing Information Technology**: Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes. Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.	8

TEXT BOOK:

1. O Brian, “Management Information System”, TMH
2. Gordon B. Davis & Margrethe H. Olson, “Management Information System”, TMH
3. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley.

REFRENCE BOOKS:-

1. O Brian, “Introduction to Information System”, MCGRAW HILL.
2. Murdick, “Information System for Modern Management”, PHI.
3. Jawadekar, “ Management Information System”, TMH.
4. Jain Sarika, “Information System”, PPM
5. Davis, “Information System”, Palgrave Macmillan

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return x^2 -y^2 , otherwise y^2 - x^2)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS):**Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management:**Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8
	Textbooks: 1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill. 2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication. 3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers. 4. Pankaj Jalote, Software Engineering, Wiley 5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.	

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.

2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.

3.Henk Alblas and Albert Nymeyer,"Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

	NIT-061 Information Retrieval and Management	3 1 0
Unit	Topic	Proposed Lectures
I	Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. Automatic Text Analysis, Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficient, Classification Methods, Cluster Hypothesis. Clustering Algorithms, Single Pass Algorithm, Single Link Algorithm, Rochhio's Algorithm and Dendograms	8
II	File Structures, Inverted file, Suffix trees & suffix arrays, Signature files, Ring Structure, IR Models, Basic concepts, Boolean Model, Vector Model, and Fuzzy Set Model. Search Strategies, Boolean search, serial search, and clusterbased retrieval, Matching Function. Performance Evaluation- Precision and recall, alternative measures reference collection (TREC Collection), Libraries & Bibliographical system- Online IR system, OPACs, Digital libraries - Architecture issues, document models, representation & access, Prototypes, projects & interfaces, standards	8
III	Taxonomy and Ontology: Creating domain specific ontology, Ontology life cycle Distributed and Parallel IR: Relationships between documents, Identify appropriate networked collections, Multiple distributed collections simultaneously, Parallel IR - MIMD Architectures, Distributed IR – Collection Partitioning, Source Selection, Query Processing	8
IV	Multimedia IR models & languages- data modeling, Techniques to represent audio and visual document, query languages Indexing & searching- generic multimedia indexing approach, Query databases of multimedia documents, Display the results of multimedia searches, one dimensional time series, two dimensional color images, automatic feature extraction.	8
V	Searching the Web, Challenges, Characterizing the Web, Search Engines, Browsing, Mata searchers, Web crawlers, robot exclusion, Web data mining, Metacrawler, Collaborative filtering, Web agents (web shopping, bargain finder), Economic, ethical, legal and political issues..	8

Text Books :

1. Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6
2. I. Witten, A. Moffat, and T. Bell, “Managing Gigabytes” 4. D. Grossman and O. Frieder “Information Retrieval: Algorithms and Heuristics”

Reference Books :

1. Mark leven, “Introduction to search engines and web navigation”, John Wiley and sons Inc., ISBN 9780-170-52684-2.
2. V. S. Subrahamanian, Satish K. Tripathi “Multimedia information System”, Kulwer Academic Publisher
3. Chabane Djeraba, ”Multimedia mining A highway to intelligent multimedia documents”, Kulwer Academic Publisher, ISBN 1-4020-7247-3

NIT-062 Modelling and Simulation		3 1 0
Unit	Topic	Proposed Lectures
I	System definition and components, stochastic activities, continuous and discrete systems, System modeling, Types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.	8
II	System simulation, Need of simulation, Basic nature of simulation, techniques of simulation, comparison of simulation and analytical methods, types of system Simulation, real time simulation, hybrid simulation, simulation of pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag model, Cobweb model.	8
III	Simulation of continuous Systems, analog vs digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an auto-pilot. Discrete system simulation, fixed time-step vs event-to-event model, generation of random numbers, test of randomness, Monte-Carlo computation vs stochastic simulation.	8
IV	System dynamics ,exponential growth models, exponential decay models, logistic curves, system dynamics diagrams, world model.	8
V	Simulation of PERT networks, critical path computation, uncertaintities in activityduration, resource allocation and consideration, Simulation languages, object oriented simulation.	8

Textbooks:

1) Geoftrey Gordon, “System Simulation”, PHI
2) Narsingh Deo, “System Simulation with digital computer”, PHI. 3) Averill M. Law, W. David Kelton, “Simulation Modelling and Analysis”,TMH.

NIT-063 Bioinformatics		3 1 0
Unit	Topic	Proposed Lectures
I	Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary & reference systems, finding new type of data online. Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.	8
II	Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, Transcription-Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.	8
III	Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.	8
IV	Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.	8
V	Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.	8

Textbooks :

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

	NIT-064 Knowledge based decision Support System	3 1 0
Unit	Topic	Proposed Lectures
I	DECISION MAKING AND COMPUTERIZED SUPPORT : Management Support Systems: An Overview - Decision Making, Systems, Modeling , and Support.	8
II	DECISION SUPPORT SYSTEMS: Decision Support Systems: An Overview - Modeling and Analysis - Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, Business Analysis, and Visualization - Decision Support System Development.	8
III	COLLABORATION, COMMUNICATION, ENTERPRISE DECISION SUPPORT SYSTEMS, AND KNOWLEDGE MANAGEMENT: Collaborative Computing Technologies: Group Support Systems - Enterprise Information Systems - knowledge Management.	8
IV	INTELLIGENT DECISION SUPPORT SYSTEMS: Artificial Intelligence and Expert Systems: Knowledge-Based System - Knowledge Acquisition, Representation, and Reasoning - Advanced Intelligent Systems - Intelligent Systems over the Internet.	8
V	IMPLEMENTING IN THE E-BUSINESS ERA : Electronic Commerce - Integration, Impacts, and the Future of the Management Support Systems.	8

Text Book:

1. Efraim Turban, Jay Aronson E., Ting-Peng Liang, "Decision Support Systems and Intelligent Systems", 7th Edition, Pearson Education, 2006.

References:

1. George M .Marakas , "Decision Support Systems in the 21st century",2nd Edition, PHI, 2009. 2. Janakiraman V.S., Sarukesi K., " Decision Support Systems", PHI, 2009.

	NIT-065 Geographic Information System	3 1 0
Unit	Topic	Proposed Lectures
I	FUNDAMENTALS OF GIS,What is GIS – Introduction Defining GIS – Components of a GIS – Spatial data – Introduction - Maps and their influence on the character of spatial data – Other sources of spatial data	8
II	SPATIAL DATA MODELING :Introduction – Entity definition – Spatial data models – Spatial data structures – Modeling surfaces – Modeling networks – Building computer networks – Modeling the third dimension – modeling the fourth dimension - Attribute data management - Introduction – Why choose a databaseapproach? - Database data models – Creating a database – GIS database applications – Developments in databases	8
III	DATA INPUT AND EDITING :Introduction – Methods of data input – Data editing – Towards an integrated database - Data analysis: Introduction – Measurements in GIS – lengths, perimeters and areas – Queries – Reclassification – Buffering and neighborhood functions – Integrating data –map overlay – Spatial interpolation – Network analysis.	8
IV	ANALYTICAL MODELING IN GIS : Introduction – process models – Modeling physical and environmental processes – Modeling human Processes –Modeling the decision – making process – Problems with using GIS to model spatial processes - Output: from new maps to enhanced decisions: Introduction – Maps as output – Non-cartographic output – Spatial multimedia – Mechanisms of delivery – GIS and spatial decision support	8
V	ISSUES IN GIS - The development of computer methods for handling spatial data – Introduction – Handling spatial data manually – The development of computer methods for handling spatial data – The development of GIS - Data quality issues – Introduction –Describing data quality and errors sources of errors in GIS	8

Text Books:

1. Ian Heywood, Sarah Cornelius and Steve carver, “Introduction to geographical information systems”, Pearson Education, 4th Edition, 2012.

Refrences:

1. DeMers, M.N., “Fundamentals of Geographic Information Systems”, 3 rdEdition, Wiley Press, 2009.
2. Lo C.P. and Yeung, A.K.W.,“Concepts and Techniques of Geographic Information Systems”, Prentice Hall, 2002.
3. Burrough, P.A. and R.A. McDonald, “Principles of Geographical Information Systems”, Oxford University Press, 1998.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

TEXTBOOKS:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NIT 066 E-Business Strategies		2 1 0
Unit	Topic	Proposed Lectures
I	**Electronic Commerce Environment and Opportunities:** Background – The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to Open EDI – Electronic Commerce with WWW/Internet – Commerce Net Advocacy – Web Commerce going forward.	8
II	**Approaches to Safe Electronic Commerce:** Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET)- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash.	8
III	**Internet/Intranet Security Issues and Solutions:** The need for Computer Security – Specific Intruder Approaches – Security strategies – Security tools – Encryption – Enterprise Networking and Access to the Internet – Antivirus programs – Security Teams.	8
IV	**MasterCard/Visa Secure Electronic Transaction:** Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of Email - MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.	8
V	**Internet and Website Establishment:** Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet- Case study.	8

TEXT BOOK 1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2005.

REFERENCES 1. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004. 2. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money”, Atlantic Publishing Company, 2006.

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

References

1. Silberschatz,korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NIT 067- BIG DATA		2 1 0
Unit	Topic	Proposed Lectures
I	UNDERSTANDING BIG DATA What is big data,why big data,convergence of key trends, unstructured data, industry examples of big data, web analytics,big data and marketing,fraud and big data,risk and big data ,credit risk management, big data and algorithmic trading,big data and healthcare,big data in medicine,advertising and big data,big data technologies, introduction to Hadoop,open source technologies,cloud and big data mobile business intelligence,Crowd sourcing analytics ,inter and trans firewall analytics	8
II	NOSQL DATA MANAGEMENT Introduction to NoSQL , aggregate data models ,aggregates ,key-value and document data models, relationships, graph databases, schema less databases ,materialized views,distribution models ,sharding , master-slave replication , peer-peer replication , sharding and replication , consistency , relaxing consistency , version stamps , map-reduce , partitioning and combining , composing map-reduce calculations	8
III	BASICS OF HADOOP Data format , analyzing data with Hadoop , scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , compression , serialization , Avro file-based data structures	8
IV	MAP REDUCE APPLICATIONS Map Reduce workflows , unit tests with MRUnit , test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats .	8
V	HADOOP RELATED TOOLS Hbase,data model and implementations, Hbase clients ,Hbase examples – praxis.Cassandra ,cassandra data model , cassandra examples , cassandra clients , Hadoop integration. Pig , Grunt , pig data model , Pig Latin , developing and testing Pig Latin scripts. Hive , data types and file formats , HiveQL data definition , HiveQL data manipulation – HiveQL queries	8

Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Big-Data Black Book, DT Editorial Services, Wily India
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

G. B. Technical University, Lucknow

SYLLABUS

B.Tech THIRD and FOURTH YEAR

(Semester V, VI, VII and VIII)

Computer Science & Engineering
and
Information Technology

Effective from session 2010-11

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	ECS-503	Object Oriented Techniques	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	ECS-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	ECS-553	Object Oriented Techniques Lab*	0-0-2	-	25	25	25	50
10	ECS-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	ECS-602	Software Engineering	3-1-0	30	20	50	100	150
4	ECS-603	Compiler Design	3-1-0	30	20	50	100	150
5	ECS-604	Web Technology	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	ECS-652	Web Technology based Software Engineering Lab*	0-0-2	-	25	25	25	50
9	ECS-653	Compiler Lab*	0-0-2	-	25	25	25	50
10	ECS-654	Seminar	0-0-2	-	50	50	-	50
11	GP-601	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course***.**

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** At least 10 problems are to be considered based on corresponding theory course.***

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note:* ***ECS- 088* *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note: **ECS- 088 may be opted by only those students who didn't opt **EOE-041** as an open elective*

ECS-601: Computer Network

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

References :

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Anuranjan Misra, “Computer Networks”, Acme Learning
5. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS-602: Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design
Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing
Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management
Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

ECS-603: Compiler Design

Unit – I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.
Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis

References:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4.. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

ECS-604 Web Technology

Unit I: Introduction
Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

Unit II: Web Page Designing
HTML: list, table, images, frames, forms, CSS;
XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting
Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; introduction to AJAX, VB Script, CGI

Unit IV: Server Site Programming
Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

References

1. Xavier, C, " Web Technology and Design" , New Age International
2. Deitel, "Java for programmers", Pearson Education
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
4. Ramesh Bangia, "Internet and Web Design" , New Age International
5. Jackson, "Web Technologies" Pearson Education
6. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning

EIT-601: Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

EIT-602: ERP

UNIT - I
ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.
Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation

of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

.

ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.

References:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:
Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,

Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media
5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:
Neurocomputing and Neuroscience
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft
computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley**.**
4. Upadhyaya, "Mobile Computing", Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects

Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks

Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images

Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

[Effective from Session 2013-14]

(1st Year)

[Common to all B.Tech. Branch except Agricultural Engineering]

B.Tech. First Year (Common to all B.Tech. Courses except B.Tech. Agricultural Engg.)

(Effective from the session 2013-14)

Semester-I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ NAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. **E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books **L T P 3 1 0**

Unit -1	**1st Book**	**10 Lecture**
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche)	**Chapter 1/1**	**2**
Diode Application Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits	**Chapter 2/1**	**6**
Special Purpose two terminal Devices Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**Chapter 16/1**	**2**
Unit II	**1st Book**	**12 Lecture**
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration	**Chapter 3/1**	**2**
DC Biasing BJTs Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier	**Chapter 4/1**	**6**
Field Effect Transistor Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	**Chapter 6/1**	**4**
Unit III	**1st Book**	**6 Lecture**
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	**Chapter 10 10.1,10.4, 10.5, 10.9 1st Book**	**6**
Unit IV	**2nd Book**	**4 Lecture**
Digital Voltmeter : Introduction, RAMP Techniques **Digital Multimeters**: **Oscilloscope**: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	**5.1, 5.2 2rd Book 6.2 2nd Book 7.1,7.2,7.3, 7.4,7.5,7.20 2nd Books**	**4**
Unit V	**3rd Book**	**8 Lecture**
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	**Chapter 1, 2 3rd Book**	**8**

Text Books

1. Robert L. Boylestad &Louis Nashelsky "**Electronic Devices and Circuit Theory**" , Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "**Electronics Instrumentation**," Third Edition, TMH Publication 2012

3. George Kennedy, "**Electronic Communication System**", Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell " **Electronics Devices and Circuits**", 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "**Electronics Devices and Circuits**", 3rd Edition , TMH 2008

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202

ENGINEERING CHEMISTRY

L	T	P
3	1	0

UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^{1H}NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	**Force Systems:** • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. **Friction:** • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.	8
II	**Basic Structural Analysis:** • **Plane Truss**, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.	8
III	**Centroid and Moment of Inertia:** • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.	8
IV	**Kinematics of Rigid Body:** • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity **Kinetics of Rigid Body:** • Introduction, Force, Mass and Acceleration, Newton's law of	9

	motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum.	
V	**Mechanics of Deformable Solids:** • **Simple stress and strain**: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • **Bending of Beams**: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • **Theory of Torsion**, Torque and twist, Shear stress due to torsion circular sections.	**08**

References:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiah, University Press.
12. "Engineering Mechanics" , K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

NEE101/NEE201: ELECTRICAL ENGINEERING

L T P 3 1 0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation

Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems) 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

(Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

L	T	P
3	1	0

Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics **06 Hrs**.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II **06 Hrs.**

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III **10 Hrs.**

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV **08 Hrs.**

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NME-101/201: Basic Manufacturing Processes L T P [2 0 0]

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. **1**

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. **2**

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. **2**

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. **2**

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working **4**

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. **3**

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. **1**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **3**

Misc. Processes: Introduction to Galvanizing and Electroplating. **1**

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

NAS 105/ NAS 205 : ENVIRONMENT AND ECOLOGY

2 0 0

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.
Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Enginnering Mathematics,Volume-II,John Wiley&Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing Hous**e.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I **07 Hrs**

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II **08 Hrs**

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III **06 Hrs.**

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV **09 Hrs**

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

NME-152/NME/252 : Engineering Mechanics Lab

L T P [0 0 2]

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

NEE151/NEE251 : ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

    Between 90-100%----------Print 'A'
    80-90%----------Print 'B'
    60-80%----------Print 'C'
    Below 60%----------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

    Train No.: *integer type*
    Train name: *string*
    Departure Time: aggregate type TIME
    Arrival Time : aggregate type TIME
    Start station: string
    End station : string

    The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

    (i) List all the trains (sorted according to train number) that depart from a particular section.
    (ii) List all the trains that depart from a particular station at a particular time.
    (iii) List all he trains that depart from a particular station within the next one hour of a given time.
    (iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

L T P
[0 1 3]

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'. 3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

NCE-151/251 : Computer Aided Engineering Graphics

L T P

0 1 3

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,

AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

NAS-151/NAS-251: PHYSICS LAB

L T P
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

B. Tech. (2nd Year)

1. **Mechanical Engineering**
2. **Production Engineering**
3. **Industrial & Production Engineering**
4. **Mechanical & Industrial Engineering**
5. **Manufacturing Technology**
6. **Automobile Engineering**
7. **Aeronautical Engineering**

[Effective Form session 2014-15]

STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / *Aeronautical Engineering*
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NME-301	Material Science	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NME-303	Thermodynamics	2	1	0	15	10	25	50	75	3
7	AUC-001/ AUC-002	*Human Value & Professional Ethics/Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
8	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
9	NME-351	Material Science & Testing Lab.	0	0	2	10	10	20	30	50	1
10	NME-352	Machine Drawing I	0	0	3	10	10	20	30	50	1
11	NME-353	Thermodynamics Lab.	0	0	2	10	10	20	30	50	1
12	NGP-301	GP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: *Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).*

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / *Aeronautical Engineering*
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEE-409	Electrical Machines & Controls	3	1	0	30	20	50	100	150	4
3	NME-401	Applied Thermodynamics	3	1	0	30	20	50	100	150	4
4	NME-402	Manufacturing Science & Technology I	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NME-403	Measurement and Metrology	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security/Human Value & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
8	NEE-459	Electrical Machines & Controls Lab.	0	0	3	10	10	20	30	50	1
9	NME-451	Machine Drawing II	0	0	3	10	10	20	30	50	1
10	NME-452	Manufacturing Technology I Lab.	0	0	2	10	10	20	30	50	1
11	NME-453	Measurement and Metrology Lab.	0	0	2	10	10	20	30	50	1
12	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NCE- 301: FLUID MECHANICS **L T P**
3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,
2. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
3. White,F.M. "Fluid Mechanics" TMH, New Delhi.
4. Munsen et al ,"Fundamental of Fluid Mechanics" Wiley Newyork Ltd
5. Garde, R.J., " Fluid Mechanics", SciTech Publications Pvt. Ltd
6. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education

NME- 301: MATERIAL SCIENCE **L T P**
3 1 0

Unit-I

Introduction : Importance of materials. historical perspective, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bondings.

4

Crystallography and Imperfections : Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. Xray crystallography techniques. Imperfections, Defects & Dislocations in solids.

3

Unit-II

Mechanical properties and Testing : Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testing of material such as Strength tests, Hardness tests, Impact tests, Fatigue tests, Creep tests, and Non-destructive testing (NDT).

4

Microstructural Exam : Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.

2

Phase Diagram and Equilibrium Diagram : Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

3

Unit-III

Ferrous materials : Various types of carbon steels, alloy steels and cast irons, its properties and uses.

2

Heat Treatment : Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering (Austempering, Martempering), and various case hardening processes. Time Temperature Transformation (TTT) diagrams.

2

Diffusion: Diffusion of Solids, Ficks I and II law.

1

Non-Ferrous metals and alloys : Non-ferrrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type of Brass and Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys.

3

Unit-IV

Dielectric Materials: Dielectric Materials and their applications.

1

Magnetic properties : Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.

2

Electric properties, Semi conductors and Super conductors: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Super conductivity and its applications. Messier effect. Type I & II superconductors. High Tc superconductors.

5

Unit-V

Ceramics : Structure types and properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.

2

Plastics : Various types of polymers/plastics and its applications. Mechanical behaviour and processing of plastics. Future of plastics.

2

Other materials : Brief description of other material such as optical and thermal materials, Composite Materials and its uses. Introduction to Smart materials & Nano-materials and their potential applications

3

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

2

Books and References:

1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.
2. Elements of Material Science & Engineering by Van Vlack, Pearson
3. Materials Science and Engineering - A First Course by Raghavan, PHI
4. Material Science and Engineering by Smith, Hashemi and Prakash, TMH
5. Introduction to Materials Science for Engineers by Shackelford, Pearson
6. Material Science by Narula , TMH.
7. Material Science for Engineering Students by Fischer, Academic Press
8. Technology of Engineering materials by Philip and Bolton, Butterworth-Heinamann

NME-302: MECHANICS OF SOLIDS **L T P**

3 1 0

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended

columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by.Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and & Yơungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI
7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NME-303 : THERMODYNAMICS **L T P**
2 1 0

Unit – I:

Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases.

3

Zeroth law of thermodynamics: Concept of Temperature and its' measurement, Temperature scales.

1

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, , Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I.

3

Unit – II:

First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

2

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

4

Unit – III

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

4

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

3

Unit – IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Mollier chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

5

Introduction to IC engines: Compression Ignition engines, Spark Ignition engines, 2 stroke and 4 stroke engines, Performance parameters of IC engine, Heat balance sheet.

2

Books and References:

1. Engineering Thermodynamics by P.K.Nag, TMH
2. Thermodynamics by Shavit and Gutfinger, CRC Press.
3. Thermodynamics- An Engineering Approach by Cengel & Boles, TMH.
4. Basic Engineering Thermodynamics, Joel, Pearson.
5. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
6. Engineering Thermodynamics by Dhar, Elsevier.
7. Engineering Thermodynamics by Onkar Singh, New Age International.
8. Thermodynamics by Prasanna Kumar Pearson
9. Engineering Thermodynamics by C.P. Arora.
10. Engineering Thermodynamics by Rogers and Mayhew, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Fundamentals of Thermodynamics - Sonntag, Borgnakke and Van Wylen , John Wiley
13. Engineering Thermodynamics by Jones and Dugans, PHI

14. Modern Engineering Thermodynamics by Balmer, Academic Press.
15. An Introduction to Thermodynamics, By Rao, University Press.

NME- 351: FLUID MECHANICS LAB. **L T P**
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NME- 351: MATERIALS SCIENCE AND TESTING LAB. **L T P**
0 0 2

In this lab Experiments on Material Science and Experiments on Material Testing are to be conducted as given below:

(A). Experiments on Material Science (at least 5 of the following):
1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & micro examination of the welded specimen.
10. Study of Magnetic/ Electrical/Electronic materials.

(B). Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

NME-352: MACHINE DRAWING -I LAB

L	**T**	**P**
0	**0**	**3**

Introduction (1 drawing sheets)

Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

2

Orthographic Projections (3 drawing sheets)

Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

3

Fasteners (2 drawing sheets)

Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

2

Riveted joints (1 drawing sheet)

Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

1

Assembly drawing (2 drawing sheets)

Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

2

Free hand sketching (1 drawing sheet**)**

Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

1

Computer aided drafting (1 drawing**)**

Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts

1

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

NME-353 : THERMODYNAMICS LAB **L T P**
0 0 2

Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance sheet for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment(s) on thermodynamics

NEE 409 ELECTRICAL MACHINES & CONTROL **L T P**
0 0 2

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.

Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt- Amp relations, Efficiency, Advantages & Disadvantages, Applications.

D.C. Motors: Concept of starting, Speed control, Losses and Efficiency *(simple numericals only)*

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque- slip characteristics, Speed control *(simple numericals only).*

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. *(simple numericals only)*

Synchronous Motor *(conceptual treatment only)*: Starting, Effect of excitation on line current (V-curves), Synchronous condenser.

Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force- current analogy, Electrical analog of simple mechanical systems; Concept of transfer function & its determination for simple systems.

Control System: Open loop & closed loop controls systems; advantages and disadvantages.

Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, Limitations (*simple numerical only*); *Only conceptual treatment of* Polar plot, Nyquist stability criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and Phase margin and their determination.

Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Books and References:

1. I. J. Nagrath & D. P. Kothari, “Electrical machines”, Tata McGraw Hill.
2. P.S.Bimbhra, “Electrical Machinery”, Khanna Publishers
3. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
4. Ghosh, “Control Systems: Theory and Applications”, Pearson
5. B.C. Kuo, “Automatic Control systems”, Wiley India Ltd.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, “Control Systems: Principles and Design” Tata McGraw Hill.

EME-401: APPLIED THERMODYNAMICS **L T P**
3 1 0

Unit-I

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

3

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

4

Unit-II

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

6

Condenser: Classification of condenser, air leakage, condenser performance parameters.

2

Unit-III

Vapour Power cycles: Carnot vapour power cycle, Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

4

Steam Engines: Modified Rankine cycles, working and classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance.

3

Unit-IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow.

3

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

4

Unit-V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

4

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

3

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, TMH
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI

5. Theory of Stream Turbine by W.J. Kearton
6. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man
7. Gas Turbine, by V. Ganeshan, Tata Mc Graw Hill Publishers.
8. Steam & Gas Turbine by R.Yadav, CPH Allahabad
9. Thermodynamics and Energy Systems Analysis, Borel and Favrat, CRC Press
10. Mechanics and Thermodynamics of Propulsion, Hill and Peterson, Pearson
11. Thermal Engineering by Kulshrestha, Vikas Publishing.
12. Thermal Engg. By P.L. Ballaney, Khanna Publisher
13. Thermal Engg. By R.K. Rajput, Laxmi Publication

NME- 402 : MANUFACTURING SCIENCE & TECHNOLOGY-I **L T P**
3 1 0

Unit-I

Introduction :
Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items.
2

Metal Forming Processes :
Elastic & plastic deformation, yield criteria(Mises' and Tresca's). Hot working versus cold working.
2

Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.
5

Unit-II

Metal Forming Processes (continued):
Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application.
3

Condition for Rolling force and power in rolling. Rolling mills & rolled-sections.
2

Design, lubrication and defects in metal forming processes.
2

Unit-III

Sheet Metal working :
Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load(capacity) needed.
4

Analysis of forming process like cup/deep drawing. Bending & spring-back.
3

Unit-IV

Casting (Foundry)
Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting,. Sand casting, defects & remedies and inspection. Cupola furnace.
7

Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO_2 casting and Stir casting etc.
3

Unit-V

Unconventional Metal forming processes :
Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming.

2

Powder Metallurgy :
Introduction to Powder metallurgy manufacturing process. Application and, advantages.

1

Jigs & Fixtures :
Locating & Clamping devices & principles. Jigs and Fixtures and its applications.

2

Manufacturing of Plastic components :
Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

2

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by P.C. Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., TMH
5. Manufacturing Processes by Shan, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson
7. Materials and Manufacturing by Paul Degarmo.
8. Manufacturing Processes by Kaushish , PHI
9. Principles of Foundry Technology, Jain, TMH
10. Production Technology by R.K. Jain

EME -403 : MEASUREMENT AND METROLOGY **L T P**
3 1 0

Unit-I

MECHANICAL MEASUREMENTS
Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static performance characteristics and elementary idea of dynamic performance characteristics of measurement devices, calibration, concept of error (systematic and random), sources of error, statistical analysis of errors.

4

Sensors and Transducers:
Types of sensors, types of transducers and their characteristics.

2

Signal Transmission and Processing:
Signal transmission and processing devices and systems. Signal display & recording devices

2

Unit-II

Time Related Measurements:
Stroboscope, frequency measurement by direct comparison. Measurement of displacement

2

Measurement of Pressure:
Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

1

Strain Measurement:
Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

2

Temperature Measurement:
Thermometers, bimetallic thermocouples, thermistors and pyrometers.

2

Measurements of Force, Torque, Acceleration, and Vibration:
Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments, accelerometers vibration pick ups and decibel meters, vibrometers.

3

Unit-III:

Measurement of Fluid Velocity and Flow rate:
Measurement of fluid velocity, Hot Wire Anemometry, Laser Doppler Velocimetry. Flow measuring devices, Rotameter.

2

METROLOGY
Metrology and Inspection :
Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardisation.

2

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator.

2

Limit gauges classification, Taylor's Principle of Gauge Design.

1

Unit-IV
Measurement of geometric forms like straightness, flatness, roundness.

2

Tool makers microscope, profile project autocollimator.

1

Interferometry: principle and use of interferometry, optical flat.

2

Measurement of screw threads and gears.

1

Surface texture: quantitative evaluation of surface roughness and its measurement.

1

Books and References:

1. Experimental Methods for Engineers by Holman, TMH
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, TMH
5. Measurement Systems, Application Design by Doeblein, TMH
6. Hume K.J., "Engineering Metrology", MacDonald and Co
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

NME-451: MACHINE DRAWING -II LAB **L T P**
0 0 3

Review of Orthographic Projections (2 drawing sheets)
Orthographic projection of solids in first angle of projection, missing lines views, interpretation of views

2

Part and Assembly Drawing (4 drawing sheets)
Introduction to assembly drawing, steps in making of assembly drawing, assembly drawing of footstep bearing, lathe tool post, lathe tool post, tail stock stuffing box, connecting rod, gate valve, screw jack, Ramsbottom's safety valve etc.

4

Production drawing: (2 drawing sheet)
Limits, fits and tolerances, types of tolerances and fits, hole basis and shaft basis of fits, and geometric dimensioning and tolerance, surface texture, indication of surface roughness, methods of placing machining symbols on orthographic views

2

Computer Based Solid Modeling (4 computer based drawing assignments)
Introduction, input, output devices, introduction to any 3D modeling software like AutoCAD, Solidworks, Creo Parametric, Autodesk Inventor etc., basic commands and development of 3D drawings of simple machine parts and assemblies.

4

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
3. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy-New Age
5. Autodesk Inventor by Examples, Sam Tikoo, Wiley

NME-452 : MANUFACTURING TECHNOLOGY-1 LAB **L T P**
0 0 3

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

NME 453: MEASUREMENT & METROLOGY LAB **L T P**
0 0 2

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. Experiment on measurement of pressure.
11. Study of temperature measuring equipments.
12. Measurement using Strain gauge.
13. Measurement of speed using stroboscope.
14. Experiment on measurement of flow.
15. Measurement of vibration/power.
16. Experiment on dynamometers.
17. To study the displacement using LVDT.

NEE – 459 : ELECTRICAL MACHINES & CONTROL LAB **L T P**
0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System [Out of total 10, at least 04 experiments should be Simulation based]

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an AC 2-phase servo motor.
4. To study dc servo position control system within P and PI configurations.
6. To study Synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

3rd Year

[Effective from session 2015-16]

1. B. Tech. Mechanical Engineering
2. B. Tech. Production Engineering
3. B. Tech. Industrial & Production Engineering
4. B. Tech. Mechanical & Industrial Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NME-505	I.C. Engines & Compressors	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NME-604	Refrigeration & Air-conditioning	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-014	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NME-654	Refrigeration & Air Conditioning Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NPI-501	Production Planning & Control	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NPI-601	Principles of Machine Tool Design	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-015	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NPI-651	Machine Tool Design Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency						50		50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

NME-501 : MACHINE DESIGN-I **L T P**
2 1 0

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

3

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

4

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

4

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

4

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

4

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

4

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

4

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

3

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion

6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-502 : KINEMATICS OF MACHINES **L:T:P**
3: 1: 0

Unit I

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

4

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, rubbing velocity at a pin joint, instantaneous center method, types and locations of instantaneous center, Kennedy's theorem, velocities in four bar mechanism and slider crank mechanism.

4

Unit II

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism, Klein's construction for slider crank mechanism and four bar mechanism, analytical method for slider crank mechanism.

4

Kinematic synthesis of mechanism:

Introduction, dimensional synthesis of mechanisms, motion, path and function generation, Chebyshev spacing, three position synthesis, graphical approach for four link mechanisms, straight line mechanisms, special mechanisms – indicator diagram mechanisms, steering mechanisms, Hook's Joint

4

Unit III

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration, simple harmonic and cycloidal motions of follower. Analytical methods for cam profile.

8

Unit IV

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, interference and undercutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

8

Unit V

Friction drives

Introduction, belt and rope drives, open and crossed belt drives, velocity ratio, slip, power transmission, effect of mass of belt on power transmission, maximum power transmission, initial tension and maximum tension, pivots and collars, uniform pressure and uniform wear, clutches.

8

Books:

1. Theory of Mechanisms and Machines: A Ghose and A K Malik, East West Press Pvt Ltd.
2. Theory of Mechanisms and Machines: J JUicker, G R Pennock and J E Shigley, Oxford University Press.
3. Kinematics and dynamics of machinery: C E Wilson and J E Sadler: PEARSON
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Machines: S S Rattan, McGraw Hill
6. Theory of Machines: Thomas Bevan, Pearson

NME-503: MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 1 0

Unit I

Metal Cutting-

Mechanics of metal cutting.Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants.Tool materials. Tool wear and tool life. Machinability.Dynamometer, Brief introduction to machine tool vibration and surface finish.Economics of metal cutting.

9

Unit-II

Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III

Grinding &Super finishing

(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:

Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV

B. Metal Joining (Welding)

Survey of welding and allied processes.Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters.Resistance welding - spot, seam projection etc.Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds and

remedies. Weld decay in HAZ.

10

Unit-V

C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.
4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

NME-504 : HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1

Introduction to Heat Transfer:

Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :

General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :

Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

5

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

NME-505 : I C ENGINES & COMPRESSORS **L T P**

3 1 0

Unit-1

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.

Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles

Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III

CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings

Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

NPI-501: PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.

7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

NME-551 : MACHINE DESIGN-I Lab **L T P**

0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

NME-553 : MANUFACTURING TECHNOLOGY -II – LAB **L T P**

0 0 3

Minimum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints.

NME-554 : HEAT & MASS TRANSFER – LAB **L T P**

0 0 3

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment
14. Heat exchanger - Counter flow experiment

NME-602: MACHINE DESIGN-II **L T P**

3 1 0

UNIT I

Principle of transmission and conjugate action

Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears

Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

6

UNIT II

Bevel gears

Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-603 : DYNAMICS OF MACHINES **L T P**
3 1 0

Unit I

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

7

Unit II

Gyroscope:

Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopicstabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

4

Mech. Vibrations:

Types of Vibration, Degrees of freedom. Longitudinal Vibration: Single degree free and damped vibration. Forced vibration of single degree under harmonic excitation.Vibration isolation.Whirling of shaft and critical speed.

5

Unit III

Balancing:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,balancing of single cylinder engine, balancing of multi cylinder inline engines.

8

Unit IV

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor, Controlling force diagrams for Porter governor and spring controlled governors.

8

Unit V

Brakes and dynamometers:

Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

8

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

NME-604 : REFRIGERATION & AIR CONDITIONING **L T P**
3 1 0

Unit-1

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5

Refrigeration Equipment & Application:

Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

NPI- 601 : PRINCIPLES OF MACHINE TOOL DESIGN **L T P**
3 1 0

Unit-I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc.General requirement of machine tool design.Machine tool design process. Tool wear, force Analysis.

9

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, election of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

8

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

7

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

3

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports.

3

Layout of bearings, selection of bearings machine tools

2

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools.

5

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls.Basics of numerical controls.Machine tool testing.

3

Books :
1. Machine Tools Design & Numerical Controls by N.K. Mehta, McGraw-Hill
2. Design of Machine Tools by S.K. Basu Allied Publishers.
3. Principles of Machine Tools by Bhattacharya and Sen. New Central Book Agency.
4. Machine Tool Design Handbook by CMTI, McGraw-Hill.

NME-011 : ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduction:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Intgerlinear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern searchmethods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's andVariable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem fromarithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization,Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

NME-012: FINITE ELEMENT METHODS **L T P**
3 1 0

Unit 1
Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.
Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II
Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III
Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV
Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials.
Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V
Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.
Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning
3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

NME-013 : MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I

Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III

Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

NME-014: MECHATRONICS **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semi conductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semi conductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, “Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, “Introduction to Mechatronics & Measurement Systems, 4e”, McGraw-Hill Education, 2014.
3. M Jouaneh, “Fundamentals of Mechatronics”, Cengage Learning, 2013.
4. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
6. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, “Mechatronics”, McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. “Mechatronics: Integrated Mechanical Electronic Systems”, Wiley

NME-021 : FLUID MACHINERY **L T P**
2 1 0

UNIT-I

Introduction: Impulse of Jet and Impulse Turbines:

Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler’s fundamental equation.Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & *c*urve),Classification of turbines, Impulse turbines, Constructional details, Velocity triangles,Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power andefficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principlesof similarity, Unit and specific speed, Performance characteristics, Selection of waterturbines.

8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficienciesof centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV

Positive Displacement and other Pumps:

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.
Hydraulic ram, Jet pumps, Air lift pumps.

8

BOOKS:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.

10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

NME -022: PRODUCT DESIGN & DEVELOPMENT **L T P**
2 1 0

UNIT I:
Introduction to Product Design, Applications, Relevance, Product Definition, Scope, Design definitions, The role and nature of design, Old and new design methods, Design by evolution vs design by innovation. Examples such evolution of bicycle, safety razor etc. Need based development, Technology based developments. Physical realisability& Economic feasibility of design concepts.

8

UNIT II:
Morphology of Design, Divergent, Transformation and Convergent phases of product design, Identification of need, Analysis of need, Design criteria, Functional aspects, Aesthetics, ergonomics, form (structure). Shape, size, color, Creativity, Mental blocks in creativity, Removal of blocks, Ideation Techniques.

8

UNIT III:
Transformations stage of design, Brainstorming &Synectics, Morphological techniques, Utility concept, Utility value, Utility index, Economic aspects of design, Fixed and variable costs, Break-even analysis, Product Appraisal Information and literature search, patents, standards and codes, Environment and other safety considerations in product design.

8

UNIT IV:
Reliability, Reliability considerations in product design, Bath tub curve, Reliability of systems in series and parallel. Failure rates, MTTF and MTBF, Optimum spares from reliability consideration, Design of displays and controls, Man-Machine interface, Compatibility of displays and controls, Ergonomic aspects of design, Anthropometric data and its importance in design

8

Books and references:

1. Product Design & Manufacturing - A.K.Chitale&R.C.Gupta, Prentice Hall.
2. Engg . Product Design -C .D. Cain, Bussiness Books.
3. Product Design by Otto and Wood- Pearson
4. Industrial design for Engineers –W .H. Mayall, Itiffe.
5. Product Design & Decision Theory - M.K. Starr - Prentice Hall
6. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall.
7. Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
8. Human Factor Engg. – Mccormick E.J., McGraw-Hill.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H .Flurscheim, The Design Council - London.

NME-023: RELIABILITY ENGINEERING **L T P**
2 1 0

UNIT-I

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

6

UNIT-II

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

8

UNIT-III

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

10

UNIT-IV

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

4

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

4

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

NME-024 : UNCONVENTIONAL MANUFACTURING PROCESSES **L T P**
2 1 0

UNIT-I

Introduction, Limitations of conventional manufacturing processes, Need for unconventional manufacturing processes, its classification and future possibilities, Hybrid processes

4

Unconventional Machining Process based on material removal by abrasion, Principle and working and applications Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet machining and Ultrasonic Machining.

4

UNIT-II

Thermoelectric unconventional methods, Principle, working and applications of Plasma Arc Machining, Laser Beam Machining, Electron Beam Machining etc

4

Working principle and applications of Electric Discharge Machining, EDM machines, EDM process characteristics, Wire electric discharge machining

4

UNIT-III

Electro-chemical machining processes, ECM, its working principle, advantages and applications, Electro-chemical grinding, Electro-chemical deburring, Chemical machining.
Unconventional welding processes: Explosive welding, Cladding etc., Under water welding, Metalizing, Plasma are welding/cutting etc.

8

UNIT-IV

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-discharge forming, water hammer forming, explosive compaction etc.

5

Electronic-device Manufacturing, Diffusion and Photo- Lithography process for electronic-device manufacturing.

3

Books and references:

1. Modern Machining Processes – P.C. Pandey
2. Advanced Machining Processes, V.K. Jain, Allied Publishers.
3. Handbook of Manufacturing Processes, James G Bralla, Industrial Press.

NME-651 : FLUID MACHINERY Lab **L T P**
0 0 3

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

NME-652 : MACHINE DESIGN-II Lab **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

NME-653 : THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

NME-654 : REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 3

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.

6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

NPI-651 : MACHINE TOOL DESIGN LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Measurement and analysis of cutting forces in orthogonal turning.
2. Flank wear – time characteristics for single point cutting tools.
3. (i) Checking the level of installation of a lathe in horizontal & vertical planes

   (ii) Checking the bed ways for straightness and parallelism.
4. Testing the main spindle of a lathe for axial movement and true running.
5. Process capability determination of a center lathe.
6. Flatness checking of a surface plate.
7. A study of devices for intermittent motion used in machine tools e.g. ratchet gear & Geneva Mechanism.
8. A study of Kinematics structure of lathe/milling machine.
9. A study of the drives for reciprocation used in machine tools.
10. Development the speed chart and gearing diagram for a gassed head lathe.
11. A study of the cone pulley drive in center lathe and development of its raydiagram for the speed structure.
12. Efficiency testing of lathe at various parameters-values.
13. Accuracy analysis of finished cylindrical work-pieces produced on a lathe.
14. Cutting (turning) with inclined placed tool (in tool fixture).
15. Turning with two simultaneously cutting tool (one from front on usual tool postand the other tool from back on tool-fixture on carriage)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20011-12]

YEAR IV, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY											
1.	EOE-071-EOE-074	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	EME-031 to EME-036	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EME-041 to EME-046	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
4.	EME-701	Computer Aided Design	3	1	0	30	20	50	100	150	4
5.	EME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
6	*EHU-111*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
PRACTICAL/TRAINING/PROJECT											
7.	EME-751	CAD/CAM Lab	0	1	2	10	10	20	30	50	1
8.	EME-752	I.C.Engine & Automobile Lab	0	0	2	10	10	20	30	50	1
9	EME-753	Project	0	0	3	-	50	50	-	50	2
10	EME-754	Industrial Training I & II Evaluation and viva-	0	0	2		50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**6**	**9**	**-**	**-**	**-**	**-**	**1000**	**26**

Note-***Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through Report and viva voice etc.

* Project should be initiated in 7th semester beginning, and should be completer by the end of 8th semester with good Report and power-point Presentation etc.

Paper Code	**Open Electives – I**
EOE-071	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operations Research
EOE-074	Introduction to Biotechnology

DEPARTMENTAL ELECTIVES:

Department Elective - III

1. EME-031 Computer Aided Manufacturing
2. EME-032 Project Management
3. EME-033 Advanced Fluid Mechanics
4. EME-034 Experimental Stress Analysis
5. EME-035 Advanced Dynamics of Machines
6. EME-036 Management Information System

Department Elective - IV

1. EME-041 Total Quality Management
2. EME-042 Thermal Turbo Machines
3. EME-043 Mechanical System Design
4. EME-044 Tribology
5. EME-045 Industrial Ergonomics
6. EME-046 Concurrent Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20011-12]
YEAR IV, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY											
1.	EOE-081-EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EME-051-EME-056	Departmental Elective - V	3	1	0	30	20	50	100	150	4
3.	EME-061-EME-066	Departmental Elective – VI	3	1	0	30	20	50	100	150	4
4.	EPI-801	Quality Control	3	1	0	30	20	50	100	150	3
7	*EHU-111*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	-
PRACTICAL/TRAINING/PROJECT											
6.	EME-851	Project	0	0	12	-	100	100	250	350	8
10.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**3**	**12**	**-**	**-**	**-**	**-**	**1000**	

Paper Code **Open Electives – II**

EOE-081 Non Conventional Energy Resources
EOE-082 Nonlinear Dynamic Systems
EOE-083 Product Development
EOE-084 Automation and Robotics

DEPARTMENTAL ELECTIVES:

Department Elective-V

1. EME-051 Operations Research
2. EME-052 Maintenance Engineering & Management
3. EME-053 Design of Thermal Systems
4. EME-054 Advanced Synthesis of Mechanisms
5. EME-055 Six Sigma Methods & Applications
6. EME-056 Concepts of Modern Physics

Department Elective-VI

1. EME-061 Finite Element Method
2. EME-062 Non-Destructive Testing
3. EME-063 Advanced Materials Technology
4. EME-064 Production & Operations Management
5. EME-065 Energy Management
6. EME-066 Fundamentals of Bio Medical Engineering

Note: (1) The students who had taken Open elective EME-073 Operations Research in VII Sem. can not take the course EME-051 Operations Research as a Departmental Elective in VIII Sem.

(2) The students who had taken departmental elective EME 021 Non Conventional Energy Resources & Utilization in VI Sem. can not take the open elective course EOE-081 Non Conventional Energy Resources in VIII Semester.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2011-12]
YEAR IV, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
		THEORY									
1.	EOE-081-EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EME-051 to EME-056	Departmental Elective - V	3	1	0	30	20	50	100	150	4
3.	EME-061 to EME-066	Departmental Elective – VI	3	1	0	30	20	50	100	150	4
4.	EME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	3
7	*EHU*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	-
		PRACTICAL/TRAINING/PROJECT									
6.	EME-851	Project	0	0	12	-	100	100	250	350	8
10.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**3**	**12**	-	-	-	-	**1000**	

Paper Code	**Open Electives – II**
EOE-081	Non Conventional Energy Resources
EOE-082	Nonlinear Dynamic Systems
EOE-083	Product Development
EOE-084	Automation and Robotics

DEPARTMENTAL ELECTIVES:

Department Elective-V

7.	EME-051	Operations Research
8.	EME-052	Maintenance Engineering & Management
9.	EME-053	Design of Thermal Systems
10.	EME-054	Advanced Synthesis of Mechanisms
11.	EME-055	Six Sigma Methods & Applications
12.	EME-056	Concepts of Modern Physics

Department Elective-VI

7.	EME-061	Finite Element Method
8.	EME-062	Non-Destructive Testing
9.	EME-063	Advanced Materials Technology
10.	EME-064	Production & Operations Management
11.	EME-065	Energy Management
12.	EME-066	Fundamentals of Bio Medical Engineering

Note: (1) The students who had taken Open elective EME-073 Operations Research in VII Sem. can not take the course EME-051 Operations Research as a Departmental Elective in VIII Sem.

(2) The students who had taken departmental elective EME 021 Non Conventional Energy Resources & Utilization in VI Sem. can not take the open elective course EOE-081 Non Conventional Energy Resources in VIII Semester.

EME-701 : COMPUTER AIDED DESIGN (CAD)

L	T	P
3	1	0

UNIT-I

Introduction:

Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications

Computer Graphics-I

CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

UNIT-II

Computer Graphics-II

Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm **4**

Geometric Transformations:

World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation **4**

UNIT-III

Curves:

Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

UNIT-IV

3D Graphics:

Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models

Application commands for AutoCAD & ProE software

UNIT-V

Numerical Methods:

Introduction, Errors in numbers, Binary representation of numbers, Root finding-Bisection method, Newton Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method

Finite Element Method:

Introduction, Principles of Finite elements modeling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element)

Books & References:

1. Computer Graphics	Hearn & Baker	Prentice Hall of India
2. Computer Aided Engineering Design	Anupam Saxena & B. Sahay	Anamaya Publishers
3. CAD/CAM	HP Groover & EW Zimmers, Jr.	Prentice Hall India Ltd.

4. CAD/CAM Theory and Practice	Ibrahim Zeid & R Sivasubramaniam	McGraw Hill
5. Computer Aided Design	RK Srivastava	Umesh Publications
6. Mathematical Elements for Computer Graphics	DF Rogers & JA Adams	McGraw Hill
7. Finite Element Method	SS Rao	
8. FE Analysis Theory and Programming	CS Krishnamoorthy	Tata McGraw Hill
9. Numerical Method for Engg Computation	MK Jain, SRK Iyenger & RK Jain	Wiley Eastern Limited
10. Computer Oriented Numerical Methods	V Rajaraman	Prentice Hall of India

EME -702

AUTOMOBILE ENGINEERING

L T P
3 1 0

Unit-I

Power Unit and Gear Box:

Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination. Design of Gear box. 7

Unit-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer. 8

Unit-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects. 5

Chasis and Suspension System:

Loads on the frame. Strength and stiffness. Various suspension systems. 3

Unit-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc. 5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI. 4

Unit-V

Automobile Air Conditioning:

Requirements, Cooling & heating systems. 2

Cooling & Lubrication System:

Different type of cooling system and lubrication system. 2

Maintenance system:

Preventive maintenance, break down maintenance and over hauling. 2

References-

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

EME-751 : CAD/CAM LAB

L	T	P
0	1	2

Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

EME-752 : I.C. ENGINES AND AUTOMOBILE LAB

L	T	P
0	0	2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.

6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.
8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

EME-801 : POWER PLANT ENGINEERING

L T P
3 1 0

Unit-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. 3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units. 2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection. 3

Unit-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant. 8

Unit-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant. 2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant 6

Unit-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants. 3

Hydro electric station

Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems. 4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc. 2

Unit-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc. 2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms. 3

Pollution

Pollution due to power generation 2

References

1. "Power Plant Engineering" F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. "Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi.
3. "Power Plant Technology" El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

EPI- 801 : QUALITY CONTROL

L	T	P
3	1	0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability. 3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation. 5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables. 7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System. 3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure. **MTBF.** Maintainability, Condition monitoring and dignostic techniques. 4

Value Engineering : Elements of value analysis, Techniques. 2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts. 6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service. 2

Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

DETAILS OF DEPARTMENTAL ELECTIVES

ELECTIVE-1

EME-011 : FLUID MACHINERY

UNIT-I

Introduction:

Classification of Fluid Machines & Devices, Application of momentum and momentum equation to flow through hydraulic machinery, Euler's fundamental equation. 4

Impact of jet:

Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat *&* curve), Effect of inclination of jet with the surface.

Hydraulic Turbines:

Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel. 4

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines. 8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Model testing, Cavitation & separation and their control, Performance characteristics. 7

UNIT-IV

Positive Displacement Pumps:

Reciprocating pump theory, Slip and coefficient of discharges, Indicator diagram, Effect and acceleration, Work saved by fitting air vessels, Comparison of centrifugal and reciprocating pumps, Positive rotary pumps, Gear and Vane pumps, Performance characteristics. 6

UNIT-V

Other Machines:

Hydraulic accumulator, Special duty pumps, Intensifier, Hydraulic press, Lift and cranes, Theory of hydraulic coupling and torque converters, Performance characteristics. 5

Water Lifting Devices :

Hydraulic ram, Jet pumps, Air lift pumps.

BOOKS:

Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
Applied Hydraulics by Addison
Hydraulic Machines by R K Rajput, S.Chand & co Ltd.
Hydraulic Machines by D S Kumar

EME-012 : UNCONVENTIONAL MANUFACTURING PROCESSES

L	T	P
3	1	0

Unit-I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes & its classification and its future possibilities. 5

Unit-II

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electro-chemical machining, ultrasonic machining, Abrasive jet machining etc. 8

Unit-III

Unconventional Machining Process (continued) : Principle and working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining etc. (these can also be used for welding). 8

Unit-IV

Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma are welding/cutting etc. 7

Unit-V

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc. 7

Electronic-device Manufacturing: Brief description of Diffusion and Photo- Lithography process for electronic-device manufacturing. 3

Books

1. Modern Machining Processes – P.C. Pandey
2. Unconventional Machining – V.K. Jain

EME -013 : **PRODUCT DEVELOPMENT AND DESIGN**

L T P
3 1 0

Unit-I: Introduction to Product Design

Introduction to PDD, Applications, Relevance, Product Definition, Scope, Terminology. Design definitions, the role and nature of design, old and new design methods, Design by evolution. Examples such evolution of bicycle, safety razor etc. Need based development, technology based developments. Physical reliability & Economic feasibility of design concepts. 7

UNIT II: Morphology of Design

Divergent, transformation and convergent phases of product design. Identification of need, Analysis of need. Design for what? Design criteria, functional aspects. Aesthetics, ergonomics, form (structure). Shape, size, color. Mental blocks, Removal of blocks, Ideation Techniques. Creativity, Checklist. 7

UNIT III: Transformations

Brainstorming & Synectics. Morphological techniques. Utility concept, Utility value, Utility index. Decision making under multiple criteria. Economic aspects of design. Fixed and variable costs. Break-even analysis. 9

UNIT IV: Reliability

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel. Failure rate, MTTF and MTBF. Optimum spares from reliability consideration. Design of displays and controls, Man-Machine interface, Compatibility of displays and controls. Ergonomic aspects. Anthropometric data and its importance in design. Applications of Computers in product design. **7**

UNIT IV: Product Appraisal

Information and literature search, patents, standards and codes. Environment and safety considerations. Existing techniques such as work-study, SQC etc. which could be used to improve method & quality of product. Innovation versus Invention. Technological Forecasting. **8**

Recommended Books:

1. Product Design & Manufacturing - A.K.Chitab & R.C.Gupta, PHI (EEE).
2. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall

3. The Art of Thought – Grohem Walls – Bruce & Co., New York
4. Product Design & Decision Theory - M.K. Starr - Prentice Hall
5. Engg . Product Design -C .D. Cain, Bussiness Books.
6. Industrial design for Engineers –W .H. Mayall, Itiffe.
   Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
7. Human Factor Engg. – Mccormick E.J., Mc GrawHill.
8. Engineering: An Introduction to Creative profession – G.C. Beakley Hw leach, Macmillan.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H . Flurscheim, The Design Council - London.
10. Quality Control & Reliability Analysis – Bijendra Singh, Khanna Publications.

EME-014 : RELIABILITY ENGINEERING

L	T	P
3	1	0

1. Introduction:
Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

2. Reliability Mathematics:
Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis Procedures, empirical reliability calculations.

3. Reliability:
Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tieset methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

4. Reliability Improvements:
Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance.

5. Reliability Testing:
Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books Recommended :
1. R.Billintan & R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha & B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

EME-021 : NON-CONVENTIONAL ENERGY RESOURCES AND UTILISATION

L:T:P
2:1:0

UNIT-1

Energy resources and their utilization :
Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation. 3

Solar radiations:
Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India. 4

UNIT-2

Solar energy:
Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing . 2
Solar thermal energy storage, Different systems, Solar pond. 2
Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants. 2

Solar photovoltaic system:
Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system. 2

UNIT-3

Biogas:
Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India. 5

Wind energy:
Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development. 3

UNIT-4

Electrochemical effects and fuel cells:
Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells,

Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells . 3

Tidal power:

Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy Limitations of tidal energy conversion systems. 2

Hydrogen Energy:

Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use.. 3

UNIT-5

Thermoelectric systems:

Kelvin relations, power generation, Properties of thermoelectric materials, Fusion Plasma generators.

Geothermal energy:

Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion. 2

Ocean energy;

Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, Economics . 2

Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity production from different energy sources, Energy options for Indian economy. 2

Books / Reference:

Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.

Kothari D.P., "Renewable energy resources and emerging technologies", Prentice Hall of India Pvt. Ltd.

Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.

Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.

EME-022 : ADVANCED WELDING TECHNOLOGY

Unit-I

Introduction : Importance and application of welding, classification of welding process. Selection of welding process. 2

Brief review of conventional welding process : Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS.CI, Al, Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing. 5

Unit-II

Advanced welding Techniques- Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc. 7

Unit-III

Advanced welding Techniques (continued) : Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing. 7

Unit-IV

Weld Design : Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels. Life predication. 4

Thermal and Metallurgical consideration.: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves. Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of weld and properties. 4

Books
Welding Hand Book

EME-023 : OPTIMISATION TECHNIQUES IN ENGINEERING

L	T	P
3	1	0

Unit-I
Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions. **4**

Unit-II
Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn – Tucker Sufficient Conditions. **8**

Unit-III
Optimization: Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg- Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue. **10**

Unit-IV
Optimization and Functions of a Complex Variable and Numerical Analysis: The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson's 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi's Iteration Method. **10**

Unit-V
Optimization in Operation Research: Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods. **8**

Books.
1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming
6. G.L. Nemhauser and L.A. Wolsey: Intger and Combinational Optimization.
7. R.G. Parker and R.L. Rardin:Discrete Optimization.

EME-024 : MECHANICAL VIBRATION

L	T	P
3	1	0

UNIT - I

Introduction

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis **3**

Single Degree Freedom System

Free vibration, Natural frequency, Equivalent systems, Energy method for determining natural frequency, response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement **5**

UNIT - II

Single Degree Freedom: Forced Vibration

Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments **8**

UNIT- III

Two Degree Freedom systems

Introduction, Principal modes, Double pendulum, Torsional system with damping, coupled system, undamped dynamic vibration absorbers, Centrifugal pendulum absorbers, Dry friction damper **8**

UNIT- IV

Multi Degree Freedom system: Exact Analysis

Undamped free and forced vibrations of multi-degree freedom systems, influence number, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts **8**

UNIT- V

Multi Degree Freedom system: Numerical Analysis

Rayleigh's, Dunkerely's, Holzer's ad Stodola methods, Rayleigh-Ritz method **5**

CRITICAL SPEED OF SHAFTS

Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed. **3**

Books and References:

1. Mechanical Vibrations – P. Srinivasan, TMH
2. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
3. Mechanical Vibrations – W. T. Thomson
4. Mechanical Vibrations – JS Rao & K Gupta, New Age
5. Mechanical Vibrations – Tse, Morse & Hinkle
6. Mechanical Vibrations – V. Rama Murthy, Narosa Publications

EME-031 : COMPUTER AIDED MANUFACTURING (CAM)

L	T	P
3	1	0

UNIT-I

Automation

Introduction to CAM; Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends. **4**

Features of NC Machines-

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity. **3**

UNIT-II

NC Part Programming-

(a) Manual (word address format) programming. Examples Drilling, Turning and Milling; Canned cycles, Subroutine, and Macro. **5**

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement. **4**

UNIT-III

System Devices

Introduction to DC motors, stepping motors, feed back devices such as encoder, counting devices, digital to analog converter and vice versa. **3**

Interpolators

Digital differential Integrator-Principle of operation, exponential decelarion; DDA Hardware Interpolator- Linear, Circular; DDA Software Interpolator. **4**

Control of NC Systems

Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control. **3**

UNIT-IV

Computer Integrated Manufacturing system

Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection. **6**

UNIT-V

Robotics

Types and generations of Robots, Structure and operation of Robot, Robot applications. Economics, Robot programming methods. VAL and AML with examples. **6**

Intelligent Manufacturing

Introduction to Artificial Intelligence for Intelligent manufacturing. **2**

Books/References-

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. Computer control of Manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren
6. CAD/CAM by Groover.

EME-032 : Project Management L T P
3 1 0

I- Project Management Concepts:
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction. 8

II- Project Organization & Project Contracts:
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors. 8

III- Project Appraisal & Cost Estimation:
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis. 8

IV- Project Planning & Scheduling:
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique. 8

V- Modification & Extensions of Network Models:
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution.
Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections. 8

Books:

1. Project Management by K. Nagarajan
2. Project Management by Harvey Maylor

EME-033 : ADVANCED FLUID MECHANICS

L:T:P
3:1:0

UNIT-I
Review of kinematics of fluid motion, method of describing fluid motion, translation, rate of deformation, the material derivatives, acceleration, vorticity in cartesian & polar coordinates, Reynolds transport theorem, Stress at a point, velocity profile, wall shear stress. 7

UNIT-II
Non-viscous incompressible flow- Equation of continuity, Euler's equation of motion, Bernoulli's equation, circulation and its theorem, stress function, velocity potential, irrotational flow, two dimensional source, sink, source-sink pair, doublet vortex, superposition of source-sink with rectilinear flow, Rankine body, Superposition of rectilinear flow and doublet, flow around a spinning circular cylinder, Magnus effect, lift & Drag, Skin friction. Lift of aerofoils. 9

UNIT-III

Boundary layer Concept-Introduction to boundary layer formation, Novier-stokes equation, Boundary layer thickness, momentum thickness, energy thickness, Boundary layer equations, Momentum-Integral equation - Von Korman, Blasius solution of boundary layer on a flat plate without pressure gradient, Flow with very small Reynolds number, Hogen poisseuille flow, Plane Couette flow, Hydrodynamic theory of lubrication. 8

UNIT-IV

Compressible flow- Propagation of pressure change, sound velocity, elastic waves, Mach number, Mach cone, isentropic flow relations in terms of sonic velocity and mach number, Stagnation properties, Regions of flow, Energy equation, Effect of Mach number on compressibility. Propagation of infinitesimal waves, Non-steep finite pressure wave and steep finite pressure waves, Expansion waves Isentropic flow with variable area, Mach number variation and its effect on Flow through nozzles and diffusers. Area ratio, impulse function, Use of Gas/Air tables. 8

UNIT-V

Flow with normal shock waves- Development of shock wave, rarefaction wave, governing equations, Prandtle-Meyer relation. Thermodynamic properties across shock. Wind tunnels. 3

Flow in constant area duct with friction-Fanno curves, Fanno flow equations, Solution of fanno flow equations. Variation of flow properties. Tables & charts for Fanno flow. 3

Flow in constant area duct with heat transfer- Rayleigh line, Fundamental equations, Rayleigh flow relation, Variation of flow properties. Tables & Charts for Rayleigh flow. 2

Books/ References:

1. Fluid Mechanics by White.
2. Fluid Mechanics by Streeter
3. Fluid Mechanics by Som & Biswas
4. Fluid Mechanics by K.L. Kumar
5. Fluid Mechanics by A.K. Jain
6. Fluid Mechanics by Robert W. Fox & Alan T. Mc Donald, Wiley Students Edition
7. Fundamentals of Compressible flow by S.M. Yahya
8. Gas Dynamics by Z. Hussain
9. Viscous fluid flow by White
10. Computational Fluid Dynamics by Anderson
11. Gas Dynamics by E. Radhakrishnan
12. Fluid Mechanics by Kundu & Cohen, Academic Press, Elsevier

EME-034 : EXPERIMENTAL STRESS ANALYSIS

L:T:P
3:1:0

UNIT I

Elementary Elasticity:

Stress: Introduction, Stress Equations of Equilibrium, Laws of Stress Transformations, principal Stresses, Two-Dimensional State of Stress, Stresses Relative to Principal Co-ordinate System, Special States of Stress. **4**

Strain: Introduction, Displacement and Strain, Strain Transformation Equation, Principal Strains, Compatibility, Volume Dilation, Stress Strain Relations, Strain Transformation Equations and Stress Strain Relations for Two-Dimensional State of Stress. **4**

UNIT II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis. **4**

Brittle Coating Method: Coating Stresses, Failure Theories, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data. **4**

UNIT III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor. **4**

Strain Gage Circuit: Potentiometer and its Application, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges. **3**

Analysis of Strain Gage Data: Three Element Rectangular Rosette, Delta Rosette, Stress Gage, Plane Shear-Gage. **3**

UNIT IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Effect of Principal Directions, Effect of Principal Stress Difference, Stressed Model in Circular Polariscope, Light and Dark Field arrangements, Tardy Compensation, Fringe Sharpening and Multiplication by Partial Mirrors. **8**

UNIT V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method, Materials for Two-Dimensional Photoelasticity. **7**

Text Books:

1. Experiment Stress Analysis by James W. Dally and William F. Riley, International Student Edition, McGraw-Hill Book Company.
2. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.

^ Applicable only to those institutes which have the facility for Stress Analysis Lab

EME-036 : ADVANCED DYNAMICS OF MACHINERY

L T P
3 1 0

UNIT I

Dynamic Analysis of Mechanisms and Machines: Introduction, Motion of Rigid Body under a System of Forces, Principle of Virtual Work, D'Alembert's Principle and Dynamic Equilibrium, Dynamic Force Analysis, Stresses in Moving Members, Motion Analysis, Equivalent Force and Mass Method. **8**

UNIT II

Dynamics of Direct Acting Engine Mechanisms: Introduction, Piston Motion, Turning Moment on Crank-Shaft, Dynamically Equivalent Link, Approximate Expression for Turning Moment, Correction to the Approximate Expression, Turning Moment Diagram, Fluctuation of Crank-Shaft Speed, Flywheel Analysis. **8**

UNIT III

Balancing of Inertia Force and Moments in Machines: Introduction, Balancing of Rotating Masses, Two-Plane Balancing, Determination of Balancing Masses, Balancing of Internal Combustion Engines. **7**

UNIT IV

Gyroscopic action in Machines: Introduction, Motion of a Rigid Body in Three-Dimensions, Principal Axes, Angular Velocity and Momentum about Principal Axes, Euler's Equation of Motion, Euler's Modified Equation, Simple Precession of a

Symmetrical Gyroscope in Angular Precession, Gyroscopic Effects in Machines, Gyroscopic Stabilization.

UNIT V

Dynamics of Rotating Shafts: Introduction, Critical Speed, Shaft with an Unbalanced Disc at Mid-Span, Generalized Forces, Lagrange's Equation of Motion, Gyroscopic Effect on Critical Speed.

Text Book:

1. Theory of Mechanisms and Machines by Amitabh Ghosh and Ashok Kumar Malik, Affiliated East- West Press Pvt. Ltd, New Delhi.
2. Theory of Machines and Mechanisms by Joseph Edward Shigley and John Joseph Uicker, J.R. International Student Edition, Mc-Graw Hill International Company.

EME-036 : MANAGEMENT INFORMATION SYSTEM

L:T:P: 3:1:0

Unit-I

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS. 6

Unit-II

Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc. 10

Unit-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage. 8

Unit-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change.

Reports: Various types of MIS reports, GUI & Other Presentation tools. 6

Unit-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies. 10

Books

1. O.Brian, "Introduction to Information System", Mc-Graw Hill.
2. O.Brian, "Management Information System", TMH.
3. Alter, "Information Systems : A Management Perspective", Addison Wesley.
4. Arora & Bhatia, "Information Systems for Managers", Excel
5. Bansal, "Information System Analysis & Design", TMH.
6. Jawadegar, "Management Information System", TMH.
7. Murdick, "Information System for Modern Management", PHI.
8. Alexis Leon, "Enterprise Resource Planning", TMH.

Departmental Elective IV

EME-041 :TOTAL QUALITY MANAGEMENT (TQM)

Unit-I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V

IS0-9000 and its concept of Quality Management:

ISO 9000 series, Taguchi method, JIT in some details

References:

1. Lt. Gen. H.Lal, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

EME-042: THERMAL TURBOMACHINES

L:T:P
3:1:0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam & gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbo machinery, Energy transfer in turbo machines, Euler’s equation, Definition of various efficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology, Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps. 8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoity diagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient, Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guide vanes, Centrifugal Compressor characteristic curves. 4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocity diagram for axial compressor, Factors affecting stage pressure ratio, Blockage in compressor annulus, Degree of reaction, 3-D flow, Design process, blade design, calculation of stage performance, Axial compressor performance characteristic curves. 4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocity diagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord, Estimation of stage performance, Characteristic curves. 4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine. 4

Pumps : Classification of Pumps, Main components, indicator diagram and modification due to piston acceleration, Performance characteristics, Cavitation and its control, Miscellaneous types of pumps. 4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropy diagram, State losses, Estimation of stage performance, Performance characteristics. 4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustion system types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparative evaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Design with traditional materials. 8

Books-

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Design of high efficiency turbomachinery and gas turbines, David Gordon Wilson, Theodosios Korakianitis, Prentice Hall International.
3. Turbomachinery : S.M. Yahya.
4. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.
5. Gas Turbine- Ganeshan, Tata Mc Graw Hill.

EME-043 : MECHANICAL SYSTEM DESIGN

L	T	P
3	1	0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, system types, Application of system concepts in Engineering, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing **4**

Problem Formulation

Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system **4**

UNIT-II

System Theories

System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system. **4**

System modeling

Need of modeling, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system **4**

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system **4**

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system. **3**

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system **4**

Calculus Method for Optimization

Model with one decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system. **4**

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery **4**

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant **5**

Books/References-

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Design Engineering-JR Dixon, TMH, New Delhi
3. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
4. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
5. Optimization Techniques-SS Rao
6. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

Department Elective-IV

EME-044: **TRIBOLOGY**

L T P
3 1 0

Unit-I: Introduction to Tribology

Definition, Scope, Applications, Friction, Definition, Scope, Laws of friction. Friction theories. Surface contaminants, Effect of sliding speed on friction.

5

Unit-I: Wear

Definition, Scope, wear of metals, Types, Classification. Mechanism of wear, Quantitative laws. Hypothesis of Holm. Hypothesis of Burwell and Strang. Hypothesis of Archard, Rawe, Rabinowicz. Quantitative law for Abrasive wear, Bayerku surface fatigue theory. Delamination theory & Fatigue theory of wear, wear resistant materials. Introduction to wear of Polymers and Ceramics. Wear reduction by Surface Improvements, Pitting, Erosion & Stress Corrosion.

10

Unit-III: Surface Interactions

Elastic & Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies. Formulae for calculation of contact area. Physico-Mechanical properties of surface layers, Characteristics of Surface Geometry. Classes of surface roughness. Contact of rough surfaces. Interaction of surface peaks. Real and contour area of contact.

10

Unit-IV: Lubrication

Definition & Scope. Generalized Reynold's equation. Flow and shear stress, energy equation. Mechanism of pressure development in bearings. Concept of Boundry Layer.

5

Unit-IV: Bearing design considerations & characteristics

Bearing design procedure & steps. Plain slider bearing. Step (Rayleigh step) bearing. Infinitely long journal bearing. Infinitely short journal bearing. Future scope and applications.

8

REFERENCE BOOKS:

1. Introduction to Tribology of bearings by - B. C. Majumdar., S Chand & Co.
2. Hand Book of Tribology -- WHILEY
3. Fundamentals of Fluid film lubrication by – Bernard Hamrock, Mc Graw Hill International Edition.
4. Tribology in Industries by Sushil. K. Srivastava, S Chand & Publications.
5. Basic Lubrication theory by Alastair Cameron.

EME-045

INDUSTRIAL ERGONOMICS

L	T	P
3	1	0

Unit-I

1. **Introduction:** Importance applications and principles of occupational ergonomics. 2
2. **Physiological Principles:** Muscular work, Nervous control of movements, Improving working efficiency. Optimal use of muscle strength. /Guidelines for work layout. 4
3. **Skilled work:** Acquiring skill, control of skilled movements. Design of tools and equipments for skilled work. 3

Unit-II

4. **Heavy work:** Energy consumption, Efficiency, Heart rate as a measure of workload. 2

5. **Work-station Design:** Anthropometric data, Reach and clearance dimensions. Percentiles to be accommodated. 5

Unit-III

6. **Working Heights:** Comfortable working postures. Room to grasp or move things, and operate controls. Sedentary work. Its advantages, disadvantages and limitation. Sedentary workplace design. Design of VDT workstations, Design of Key board. 5

7.Handling Lads: The Human spine, back troubles associated with industrial work, Intervertebral disc, disc pressure, slip of disc, Bio-mechanical models of lower back. Recommendations for handling loads. 3

8.Man-Machine System: Display equipment, Controls, Relation between control and display instruments, Mental activity, Fatigue, Occupational stress, Job design in monotonous task. 3

Unit-IV

9.Human Visual System: Accommodation, Aperture of the pupil, Adaptation of reline, eye movements Visual capacity, Visual strain, Physiology of reading. 3

10.Ergonomic Principles of Lighting: Light sources, measurement, physiological requirements of artificial lighting, arrangement of light. Light for fine work and for VDT offices. 3

Unit-V

11.Noise and Violation: Sound perception, Noise load, damage to hearing, physiological and psychological effects of noise. Protection against noise, Vibrations and their effect on performance. 3

12.Working Environment: Thermo-regulation in human body, comfort indoors, Air quality and its dryness, Air pollution and ventilation. Heat in industry Recommendations for comfort indoors.

Daylight, colours and music for pleasant work environment. 4

Books

1. Fitting the task to the Man, E. Gandjean, Taylor and Francis.
2. A guide to Ergonomics of Manufacturing, Helander, M., East-West Press.
3. Human Factor in Engineering and Design, Sanders, M.S., and Mc Cormik, E.J., Mc Graw.Hill

DEPARTMENT ELECTIVE-IV

EME-046

CONCURRENT ENGINEERING

L	T	P
3	1	0

Unit-I

Introduction:

Background and challenges faced by modern production environment, sequential engineering process, Concurrent engineering definition and requirement, meaning of concurrent objectives of CE, benefits of CE, Life cycle design of products, life cycle costs. 4

Support for CE

Classes of support for CE activity, CE organizational, structure CE, team composition and duties, Computer based Support, CE Implementation Process. 4

Unit-II

Design Product for Customer

Industrial Design, Quality Function Deployment, house of quality, Translation process of quality function deployment (QFD). 3

Modeling of Concurrent Engineering Design

Compatibility approach, Compatibility index, implementation of the Compatibility model, integrating the compatibility Concerns. 4

Unit-III

Design for Manufacture (DFM)

Introduction, role of DFM is CE, DFM methods, e.g. value engineering, DFM guidelines, design for assembly, creative design methods, product family themes, design axioms, Taguchi design methods, Computer based approach to DFM. Evaluation of manufacturability and assemblability. 9

Unit-IV

Quality by Design

Quality engineering & methodology for robust product design, parameter and Tolerance design, Quality loss function and signal to noise ratio for designing the quality, experimental approach. 9

Unit-V

Design for X-ability

Design for reliability, life cycle serviceability design, design for maintainability, design for economics, decomposition in concurrent design, concurrent design case studies. 7

Books

1. Concurrent Engineering Kusiak John Wiley
2. Concurrent Engineering Menon Chapman & hall

Departmental Elective – V

EME-051 : OPERATIONS RESEARCH

L	T	P
3	1	0

Unit-I

Introduction: Basics of Operations Research **1**

Linear Programming- **7**

Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal & dual problem sensitivity analysis.

Unit-II

Transportation & Assignment problems. **4**

Deterministic Dynamic Programming- **4**

Multistage decision problems & solution, Principle of optimality.

Unit-III

Decision theory- **4**

Decision under various conditions.

Game Theory- **2**

Two Person Zero sum game, Solution with / without Saddle point, Dominance Rule, Different Methods like Algebraic, Graphical, Liner Programming

Sequencing- **2**

Basic assumption**,** n Jobs through two / three machines, 2 Jobs on m machines.

Unit-IV

Stochastic inventory models- **5**

Single & multi period models with continuous & discrete demands, Service level & reorder policy

Simulations- **3**

Use, advantages& limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

Unit-V

Queuing models- **3**

Characteristics of Queuing Model, M/M/1 & M/M/S system, cost consideration

Project Management: **6**

Basic concept, Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

Text Books

Operations Research by : Wangner
Operations Research by : Taha
Introduction to Management Science by: Hiller & Hiller
Operations Research by : Wayne L. Winston

EME-052 : MAINTENANCE ENGINEERING & MANAGEMENT

L:T:P
3:1:0

Unit-I

Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy-element, unit, standby, maintainability, availability, reliability and maintainability trade off. **8**

Unit-II
Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency. **8**

Unit-III
Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure. **8**

Unit-IV
Break down maintenance planning, assignment model, waiting time models expected waiting time, minimum cost service rate, PERT. **8**

Unit-V
Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management. **8**

Books:
1. Management of systems – R.N. Nauhria & R. Prakash.
2. Operations Research – Wangner.

EME-053 : DESIGN OF THERMAL SYSTEMS

L:T:P
3:1:0

Unit-I
Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations
Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.
Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant. 5
Design & Selection of Air conditioning Apparatus
Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers. 3

Unit-II
Analysis of Complete Vapour Compression System – Design and Balancing of System Components
Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different Refrigerants in performance predication of the cycle.
Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation.
Layout & selection of Refrigerant, water and Brine pipings for the designed system.
Selection of Refrigeration and Air conditioning Controls for the system. 8

Unit-III

Design of Turbomachines:

Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor. 8

Unit-IV

Design of Heat Exchanger :

Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger. 8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM. 8

References

1. Refrigeration & Air Conditioning - By C.P. Arora
2. Refrigeration & Air Conditioning - By Manohar Prasad
3. Principles of Refrigeration (S.I.Units) - By Roy J.Dossat
4. Air Conditioning Engineering - By W,P.Jones
5. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
6. Refrigeration & Air Conditioning Data Book – Manohar Prasad
7. Ashrae hand Book – Fundamentals
8. Refrigeration & Air Conditioning-Stoecker & Jones
9. Refrigeration & Air condioning – By P.L.Ballaney

EME-054 : ADVANCED SYNTHESIS OF MECHANISM

L	T	P
3	1	0

UNIT-I

Introduction:

Mechanisms, Classifications, Relative & absolute motion, degree of freedom, 4-bar mechanisms-planar & spatial mechanisms, Inversion and equivalent linkage, Transmission deviation and pressure angles **4**

Kinematic analysis of Planer motion

Relative velocity and velocity difference, Instantaneous centre, Poles and centrodes, Relative acceleration, acceleration difference

UNIT-II

Kinematic Synthesis

Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials **4**

Four bar coupler point curves:

Four bar linkage, Equation of coupler curves, Double points and symmetry, Robert Chebyshev theorem, Approximate and exact straight line mechanisms **4**

UNIT-III

Geometrical Method of Synthesis:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crank mechanism, Synthesis with three accuracy points, Pole triangle, Four position synthesis, Examples **7**

UNIT-IV

Algebraic Methods of Synthesis-I:

Displacement equation of four bar linkage, Crank and follower synthesis with three accuracy points, Four bar function generator with three accuracy points, Crank and follower synthesis: angular velocities and accelerations **8**

UNIT-V

Algebraic Methods of Synthesis-II:

Synthesis of slider crank mechanism with three accuracy points, Synthesis of slider crank mechanism with four accuracy points, Five accuracy points synthesis of crank and follower mechanism, Analysis of mechanical errors in linkage, Mechanical error in four bar linkage **8**

Books & References:

1. Kinematic Synthesis of Linkages	RS Hartenberg and J Denavit	McGraw Hill, New York
2. Kinematic and Linkage Design	AS Hall Jr	Prentice Hall India Ltd.
3. Mechanism and Machine Theory	Amitabh Ghosh and AK Mallick	
4. Mechanism Design: Analysis & Synthesis	Erdman & Sandor	Prentice Hall of India

EME-055 : Six Sigma Methods & Application

L T P
3 1 0

Unit 1

Quality Perception; Quality in Manufacturing, Quality in Service Sector; Differences between Conventional and Six Sigma concept of quality; Six Sigma success stories.
Statistical foundation and methods of quality improvement.
Descriptive statistics: Data Type, Mean, Median, Mode, Range, Variation, Standard Deviation, Skewness, Kurtosis.
Probability Distribution: Normal, Binomial, Poisson Distribution

Unit 2

Basics of Six Sigma: Concept of Six Sigma, Defects, DPMO, DPU, Attacks on X'S, Customer focus, Six Sigma for manufacturing, Six Sigma for service. Z score,
Understanding Six Sigma organization, Leadership council, Project sponsors and champions, Master Black Belt, Black Belt, Green Belts.

Unit 3

Methodology of Six Sigma, DMAIC, DFSS, Models of Implementation of Six Sigma, Selection of Six Sigma Projects.

Unit 4

Six Sigma Tools: Project Charter, Process mapping, Measurement system analysis, Hypothesis Testing, Quality Function deployment, Failure mode effect analysis, Design of Experiments.

Unit 5

Sustenance of Six Sigma, Communication plan, Company culture, Reinforcement and control, Introduction to softwares for Six Sigma, Understanding Minitab, Graphical analysis of Minitab plots.

References:

1. Six Sigma: SPC and TQM in manufacturing and service, Geoff Tennant, Gower Publishing Co.
2. Six Sigma for managers, Greg Brue, TMH
3. What is Six Sigma, Pete Pande, TMH
4. The Six Sigma Way, Peter S. Pande, TMH Team Field book
5. The Six Sigma way, Peter S. Pande, TMH

EME-056 : CONCEPTS OF MODERN PHYSICS

L T P
3 1 0

Unit-I

Atomic & Quantum Physics: Wave-Particle Duality. Atomic-models. Quantum Physics-Planck, Bohr, de-Brogli, Schrödinger, Heisenberg, Born. Quantum and Wave Mechanics. X-ray, Laser etc. 8

Unit-II

Particle Physics & Dynamics: Molecule, Atom and Nucleus. Elementary Particles (& antiparticles) and
its characteristics & historical development. Conservation laws. Quarks and quark-model. Simple particle interaction /dynamics. Feynman Diagrams & rules. 8

Unit-III

Relativistic Mechanics : Special-Relativity. Relativity as a bridge of electricity and magnetism.
Minikowaskian space-time. Introduction to General-Relativity (almost without Tensors), concept of curved
space-time and gravity as curvature. Tests of Special & General Relativity. 9

Unit-IV

Astro-physics and Cosmo-Dynamics: Brief review of universe big-bang to black-hole including nucleo-synthesis, solar-system and galaxy. Hubble's law. Critical density, space- from closed, flat, open. Recent
studies on Dark-matter and Dark-energy and its possible candidates. 8

Unit-V

Unification of forces: Fundamental forces- gravitational, electrical, magnetic, strong-nuclear & weak nuclear. Maxwell (& Faraday) unification of electric & magnetic field as electromagnetic. Brief
introduction (with Feynman diagram) to GSW Electro-weak unification, and Standard-model. Brief
mention of GUT, and String/M-theory. 7

Books

1. Stephen Hawking- Brief History of Time
2. Besier- Concept of Modern Physics
3. Krane- Modern Physics
4. Kaku- Beyond Einstein
5. Griffith- Quantum Electrodynamics
6. Griffith- Elementy Particles
7. Hartle- Gravity
8. Bryan Greene- Elegant Universe

EME-061: FINITE ELEMENT METHOD

L	T	P
3	1	0

UNIT-I

Introduction

Introduction to finite difference method and finite elements method, Advantages and limitations, Mathematical formulation of FEM, Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayliegh Ritz method, Weighted Residual methods, Point Collocation method, Galarkin method - Steps involved in FEM.

UNIT-II

Types of Elements Used

Interpolation Polynomials - Linear elements Shape function - Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.

UNIT-III

Finite Element Formulation of Field Problems

1-D and 2-D heat transfer, fluid flow (incompressible and non viscous fluid) in ducts, Simple electrical and magnetic field problems. Simple Numerical examples

UNIT-IV

Finite Element Formulation of Solid Mechanics Problems

1-D problem of shaft; Truss element analysis of pinned truss, Plane stress/strain problems, Axi-symmetric problems, thin plate problems; Vibration of shafts & beams.

UNIT-V

Numerical Methods in FEM

Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature - Solution of finite element equations – Gauss Elimination Method, Cholesky decomposition.

Books:

1.	The Finite Element Method	O.C. Zienkiewicz and R.L. Taylor	McGraw Hill
2.	An Introduction to Finite Element Method	J. N. Reddy	McGraw Hill
3.	Finite Element Procedure in Engineering Analysis	K.J. Bathe	McGraw Hill
4.	Finite Element Analysis	C.S. Krishnamoorthy	Tata McGraw Hill
5.	Concepts and Application of Finite Element Analysis	R.D. Cook, D.S. Malcus and M.E. Plesha	John Wiley
6.	Introduction to Finite Elements in Engineering	T.R Chandragupta and A.D. Belegundu	Prentice Hall India
7.	Finite Element and Approximation	O.C. Zenkiewicy & Morgan	-
8.	Numerical Methods	E Balagurusamy	Tata McGraw Hill

EME-062 : NON-DESTRUCTIVE TESTING

L T P
3 1 0

Unit-1: Introduction
Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test chalk test (oil whitening test). Attractive uses of above tests in detecting surface cracks, bond strength & surface defects. **6**

Unit-2: Common NDT methods
Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test **6**
Magnetic particle Inspection – Scope , principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results. DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications. **5**

Unit-3: Radiographic methods
X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of Radiographs, limitations of γ-ray radiography – principle, equipment. Attenuation of electro magnetic radiations, source of radioactive materials & technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor. Advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study ─ X-ray of human body. **9**

Unit-4: Ultrasonic testing methods
Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body. **8**

Unit-5: Eddy Current Inspection
Principle, Methods, Advantages, Scope and limitations. Types of Probes. Case Studies. **4**

Suggested References:

(1) ASM Handbook Vol. 11, 8th Edition – Non-destructive Testing & Evaluation
(2) Research Techniques in NDT Vol.3, R.S. Shah, Academic
(3) Industrial Quality Control, Webstar
(4) Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New York.

EME-063 : ADVANCED MATERIALS TECHNOLOGY

L T P
3 1 0

UNIT-I: Introduction to Ferrous Materials
Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons. Recognised patterns of distribution of graphite flakes in grey cast iron. **10**

UNIT-II: Heat Treatment of Steels
TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austempering and martempering of steel. Surface hardening of steel-Carbonising nitriding carbonitriding cyniding, flues and inducation hardenirng microscopic determination of case depth and depth of hardening. **5**

Unit-III: Nonferrous materials
Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials. Heat treatment of nonferrous materials– soputionizing, Aging and precipitations hardening.
Composites
Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites.
Refractory materials and coatings for high temperature applications.
Smart Materials-introduction, types and applications. Thin film shape memory alloys. **10**

Unit-IV: Biomaterials
Classes and application of materials in medicine and dentistry. Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion. **8**
Unit-V: Nuclear Materials
Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials. Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers. Radiation proof materials. Brief discussion of safety and radioactive waste disposal. **7**
References:
1. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, A.S. Hoffman, F.J. Sckoen, and J.E.L Emons, Academic Press, second edition, 2004.
2. Biomaterials: An Introduction (second edition) Joon B.Park & Roderic S.Lakes, Plenum Press, 1992.
3. Handbook of Materials for Medical Devices, Edited by J. R. Davis, ASM international, 2003.
4. Introduction to Nuclear Engineering, by J.R Lamarsh.
5. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.
6. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.

EME-064 : PRODUCTION & OPERATIONS MANAGEMENT

L : T : P
3 : 1 : 0

Unit –I (6 sessions)
Managing Operations
Operations Management – Function, Evolution, Definition, Systems view of P&OM; Operations Strategies for Competitive Advantage;

Unit –II (9 sessions)
Planning (Designing) the conversion System
Designing Products, Services and Processes; Operations Capacity; Locating Production and Service facilities; Layout Planning.

Unit-III (7 sessions)
Organizing the conversion System
Job design, Production and Operations standards, and work measurement; Project Management.

Unit-IV (8 sessions)
Scheduling Production and Service System
Scheduling systems, Aggregate Planning for Production and service system; Operations Scheduling.

Unit-V (10 sessions)
Material Requirements Planning
Planning for needs, applying MRP, Detailed capacity planning, MRP II.
Managing for World class Competition
World class Manufacturing practices; Managing for Quality; Conversion Process in change.

SUGGESTED READINGS
1) Adam Jr Everett E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)
2) Russell & Taylor III – Operations Management (Pearson, 4th Edition)
3) Hill T- Operations Management (Palgrave, 2000)
4) McGregor D – Operations Management (McGraw-Hill, 1960)
5) Morton - Production and Operations Management (Vikas)
6) Gaither & Frazier - Operations Management(Cengage Learning, 9th edition)

EME-065 : ENERGY MANAGEMENT

L T P
3 1 0

UNIT-1
Introduction to energy, Sources of energy, Forms of energy, Energy reserves, renewable energy sources, Unites of energy and the laws of thermodynamics,, Energy consumption and GDP, energy database , Energy demand analysis, Costs of exploration and utilization of depletable resources, energy pricing, National energy plan. 7

UNIT-2
Energy audit concepts, Energy audit based on 1st law and 2nd law of thermodynamics, Mass and Energy balances, Availability analysis, Evaluation of energy conserving opportunities, Economic analysis and life cycle costing. 7

UNIT-3
Energy conservation areas, Energy transmission and storage, Plant wide energy optimization Models, Data base for energy management , Energy conservation through controls, Computer aided energy management, Program organization and methodology. 7

UNIT-4
Electrical energy conservation in building lighting, heating, ventilating and air conditioning, Energy efficient motor, power factor improvement in power systems, Energy audit of Combustion process, Boilers, Turbines, compressors, Pumps, Heat exchangers, Condensers, Use of industrial, wastes. 9

UNIT-5
Energy environment interaction, Environmental issues, Global warning, Carbon dioxide emissions, Depletion of ozone layer, Government's regulations, Energy economy interaction. 7

BOOKS:

1. Energy Management and condevtion, by Clive Beggs, Butterwoth- Heinemann Elsevier Science.
2. Optimising Energy Efficiency in the Industry, By Rajan, Tata Mc Graw Hill Publishers.
3. Guide to energy Management , By C.L Capehart, Fairmont Press.

4. Renewable Energy Sources and their Environment Impact, by Abbasi & Abbasi, Prentice Hall of India.
5. Environmental Risks and Hazards by Cutter, Prentice Hall of India.
6. Energy and Power Risk Management: New Developments in Modeling, Pricing and Hedging, buy Alexander Eydeland, John Wiley & Sons.
7. Energy Management Handbook by, Wayne C. Turner.
8. Thermodynamics, By Kenneth Wark, Tata Mc Graw Hill Publishers.
9. Exergy Analysis of Thermal, Chemical and Metallurgical Process, By Jan Szargut, David R. Morris, Frank R. Steward, Hemisphere Pub, Springer Verlag Publisher

EME-066 : FUNDAMENTALS OF BIOMEDICAL ENGINEERING

L:T:P
3:1:0

UNIT I : **Biomechanics**

Statics and dynamics of the musculoskeletal system, forces and moments. Acting in the skeletal system and the various techniques used to describe them. Forces and moments with in the body such as forces acting at hip and knee joint and in the extremities. Analysis of pathological situations of human joints. **9**

UNIT II: Biomaterials

Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion. **8**

UNIT III : Bio Fluid Flow

Fluids-laminar and turbulent flow, boundary layer, non-newtonian and pulsatile models, blood rheology, circulatory system, blood-flow in arteries, veins and heart, synovial fluid, joint friction. **6**

UNIT IV : Bioinstrumentation

Fundamentals of producing a medical image, image collection techniques, image reconstruction algorithms, detailed examination of the four main areas of medical imaging : Nuclear Medicine and positron Emission Tomography, Ultrasound, Diagnostic Radiology, Magnetic Resonance and its clinical applications. Physiological signals, noise, and available sensors and transducers and their characteristics. **9**

UNIT V

Computing for Biomedical Engineers

Health care information and communications, Including telemedicine, medical informatics, networks and privacy. Data Collection, Medical coding and classification. Standards for medical data interchange. Aspects of database design, client/server topologies. **6**

Reference:

1. Basic orthopedic biomechanics, Editors-VC Mow & Wc Hayes, Lippincott Raven Publishers.
2. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, Allan S.Hoffman, Frederick J.Schoen, Jack E.Lemmons, Editors, Academic Press.
3. Biomaterials: An Introduction(second edition) Joon B.Park & Roderic S.Lakes, Plenum Press, 1992.
4. Biofluid Mechanics, Jagan N.Mezumdar; World Scientific Pub.Co.,NJ 1992
5. Handbook of Biomedical Instrumentation, RS Khandpur.
6. Mthematical models in biology and medicine- J.N.Kapur, Affliated East West Press Pvt. Ltd., NewDelhi-India
7. Bone Mechanism – W.C.Heys, CRC Press
8. Computers in Medicine- Lele.

Syllabus 2016-17

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

for

B.TECH. COMPUTER SCIENCE AND ENGINEERING

of

Second Year

(Effective from the Session: 2014-15)

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND ENGINEERING

STUDY & EVALUATION SCHEME

2nd Year SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-409	Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NCS-403	Computer Graphics	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC-459	Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NCS 453	Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I

Digital Design and Binary Numbers:

Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.

Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).

Unit-II

Combinational Logic:

Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic

Unit-III

Memory and Programmable Logic Devices:

Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.

Unit-IV

Synchronous Sequential Logic:

Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.

Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.

Unit-V

Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT)

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .

Unit – II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Unit – III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit – IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.
4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.
8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.
10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**

  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability

  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**

  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series

  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**

  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation

  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**

  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence

  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method

  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

  Recommended Books:

  - *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
  - *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
  - *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. * Douglas V. Hall, "Microprocessors and Interfacing", , Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.
4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, "IBM PC Assembly language and programming", Fifh Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :

1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Unit – III
Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit – IV
Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7.Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
8. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1.To implement CPU Scheduling Algorithms
- FCFS
- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms
- FIFO
- LRU

3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

G. B. Technical University, Lucknow

SYLLABUS

B.Tech THIRD and FOURTH YEAR

(Semester V, VI, VII and VIII)

Computer Science & Engineering
and
Information Technology

Effective from session 2010-11

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	ECS-503	Object Oriented Techniques	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	ECS-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	ECS-553	Object Oriented Techniques Lab*	0-0-2	-	25	25	25	50
10	ECS-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	ECS-602	Software Engineering	3-1-0	30	20	50	100	150
4	ECS-603	Compiler Design	3-1-0	30	20	50	100	150
5	ECS-604	Web Technology	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	ECS-652	Web Technology based Software Engineering Lab*	0-0-2	-	25	25	25	50
9	ECS-653	Compiler Lab*	0-0-2	-	25	25	25	50
10	ECS-654	Seminar	0-0-2	-	50	50	-	50
11	GP-601	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course***.**

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** At least 10 problems are to be considered based on corresponding theory course.***

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note:* ***ECS- 088* *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology
Year-III, Semester-V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	EIT-501	E-Commerce	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	EIT-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	EIT-553	Mini Project using Web Technology -1	0-0-2	-	25	25	25	50
10	EIT-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology
Year-III, Semester-VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	EIT-601	Software Project Management	3-1-0	30	20	50	100	150
4		IT-Elective-I	3-1-0	30	20	50	100	150
5	EIT-602	ERP	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	EIT-652	Software Project Management Lab *	0-0-2	-	25	25	25	50
9	EIT-653	Mini Project using Web Technology -2	0-0-2	-	25	25	25	50
10	EIT-654	Seminar	0-0-2	-	50	50		50
11	GP-601	General Proficiency	-	-	-	-	-	50

Note: *EIT-553 (Mini Project using web technology-1) started in 5th semester has to be continued and completed in 6th semester as EIT-653 (Mini Project using web technology-2)*

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year-IV, Semester-VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	EIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150
3	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
4		IT-Elective-II	3-1-0	30	20	50	100	150
5		IT-Elective-III	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	EIT-751	Cryptography & Network Security Lab*	0-0-2	-	25	25	25	50
7	EIT-752	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
8	EIT-753	Project	0-0-4	-	50	50	-	50
9	EIT-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note: **ECS- 088 may be opted by only those students who didn't opt **EOE-041** as an open elective*

SYLLABUS

(Computer Science & Engineering and Information Technology)

ECS-501: Operating System

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,

TMH
5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

ECS-502: Design and Analysis of Algorithms

Unit-I

Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit -II

Advanced Data Structures*:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.

Unit - III

Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

Unit - IV

Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

Backtracking, Branch and Bound with examples such as Travelling Salesman Problem,

Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V

Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

ECS-503: Object Oriented Techniques

UNIT I

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT III

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

UNIT IV

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,
Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

UNIT V

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application.
Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

References:

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Mark Priestley "Practical Object-Oriented Design with UML", TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education
6. Pandey, Tiwari, " Object Oriented Programming with JAVA" , Acme Learning

ECS-504: Computer Graphics

Unit – I

Introduction and Line Generation**:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations**:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces**:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Hidden Lines and Surfaces**:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", TMH

3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. Steven Harrington, "Computer Graphics: A Programming Approach" , TMH
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill

ECS-505: Graph Theory

Unit -I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit -IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem

Discussion of Graph theoretic algorithm wherever required.

References

1. Deo, N, Graph theory with applications to Engineering and Computer Science, PHI
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH
3. Robin J. Wilson, Introduction to Graph Theory, Pearson Education
4. Harary, F, Graph Theory, Narosa
5. Bondy and Murthy: Graph theory and application. Addison Wesley.
6. V. Balakrishnan, Schaum's Outline of Graph Theory, TMH
7. Geir Agnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson Education

EIT-501: E-Commerce

Unit I :

Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit II:

Network Infrastructure for E- Commerce:
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Unit III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit IV

Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit V

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.

EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison- Wesley.
2. Pete Lohsin , John Vacca "Electronic Commerce", New Age International
3. Goel, Ritendra "E-commerce", New Age International
4. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
5. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
6. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

EIT-505 Information Security and Cyber Laws

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services,

Information System Threats and attacks, Classification of Threats and Assessing Damages

Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls,

Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection

Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-IV

Security metrics- Classification and their benefits

Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mIning Security, Building Security into Software Life Cycle

Ethics- Ethical Issues, Issues in Data and Software Privacy

Cyber Crime Types & overview of Cyber Crimes

References :

1. Godbole,“ Information Systems Security”, Willey
2. Merkov, Breithaupt,“ Information Security”, Pearson Education
3. Yadav, “Foundations of Information Technology”, New Age, Delhi
4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill
5. Sood,“Cyber Laws Simplified”, Mc Graw Hill
6. Furnell, “Computer Insecurity”, Springer
7. IT Act 2000

ECS-601: Computer Network

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

References :

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Anuranjan Misra, “Computer Networks”, Acme Learning
5. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS-602: Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design
Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing
Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management
Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

ECS-603: Compiler Design

Unit – I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.
Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis

References:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4.. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

ECS-604 Web Technology

Unit I: Introduction
Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

Unit II: Web Page Designing
HTML: list, table, images, frames, forms, CSS;
XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting
Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; introduction to AJAX, VB Script, CGI

Unit IV: Server Site Programming
Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

References

1. Xavier, C, " Web Technology and Design" , New Age International
2. Deitel, "Java for programmers", Pearson Education
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
4. Ramesh Bangia, "Internet and Web Design" , New Age International
5. Jackson, "Web Technologies" Pearson Education
6. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning

EIT-601: Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

EIT-602: ERP

UNIT - I
ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.
Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation

of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

.

ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.

References:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:
Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,

Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media
5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:
Neurocomputing and Neuroscience
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft
computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley**.**
4. Upadhyaya, "Mobile Computing", Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects

Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks

Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images

Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

of

B. Tech. Civil Engineering
(2nd Year)

[Effective Form session 2014-15]

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NCE-302	Building Materials & Construction	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCE-303	Surveying-I	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Value & Professional Ethics/Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
7	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
8	NCE-352	Building Materials Lab	0	0	2	10	10	20	30	50	1
9	NCE-353	Surveying Lab	0	0	3	10	10	20	30	50	1
10	NCE-354	Building Planning & Drawing	0	0	2	10	10	20	30	50	1
11	NGP-301	NGP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: *Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).*

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NCE-401	Structural Analysis-I	3	1	0	30	20	50	100	150	4
3	NCE-402	Geo-informatics	3	1	0	30	20	50	100	150	4
4	NCE-403	Hydraulics & Hydraulic Machines	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NCE-404	Engineering Geology	2	1	0	15	10	25	50	75	3
	AUC-002/ AUC-001	*Cyber Security/Human Value & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
7	NCE-451	Structural Analysis Lab	0	0	3	10	10	20	30	50	1
8	NCE-452	Geo-informatics Lab	0	0	3	10	10	20	30	50	1
9	NCE-453	Hydraulics & Machine Lab	0	0	2	10	10	20	30	50	1
10	NCE-455	CBSNT Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	NGP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NME-302: MECHANICS OF SOLIDS **L T P**
3 1 0

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by.Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and & Yσungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI

7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NCE 301 FLUID MECHANICS

L T P
3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,

2. Cengel & Cimbala, ”Fluid Mechanics” TMH, New Delhi.
3. White,F.M. ”Fluid Mechanics” TMH, New Delhi.
4. Munsen et al ,”Fundamental of Fluid Mechanics” Wiley Newyork Ltd
5. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd
6. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student, Education

NCE 351 FLUID MECHANICS LAB

L T P
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NCE 302 Building Materials & Construction

L T
4 0

Unit-1

Classificationof building materials, buildingmaterialsandtheirperformance,economicsofthebuildingmaterials.

Stones, Requirement of goodbuildingstone,characteristicsof buildingstonesandtheirtesting.Commonbuildingstones.Methods of preservationofstones.

Bricks:Manufacturing processofclaybricks,classification of clay bricks.Propertiesofclaybricks,testing methods for clay bricks .Problemsofefflorescence&limeburstinginbricks&tiles.

Gypsum:propertiesofgypsumplaster,buildingproducts madeofgypsumandtheiruses.

Lime:Manufactureoflime,classificationsoflimes,propertiesoflime.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses,NaturalandArtificialflyash,Surkhi(burntclaypozzolona),ricehusk andashpozzolona,propertiesandspecificationsforuseinconstruction.

Timber:Classificationandidentificationoftimber,FundamentalEngineering Properties of timber,Defectsintimber,Factorsaffectingstrengthoftimber,Methods ofseasoningand preservationoftimber.Woodbasedproducts.

Asphalt,BitumenandTar:Terminology,specificationsanduses,Bituminous materials.

Unit– II

ChemistryofPlasticsmanufacturingprocess,classification,advantagesof plastics, Mechanical properties and use of plastic in construction.

Paint svarnishesanddistempers, Common constituents, types and desirable properties, Cement paints.

Ferrousmetals,Desirablecharacteristicsofreinforcingsteel.Principlesofcold working. Reinforcings telemechanical and physical propertieschemicalcomposition.Briefdiscussiononpropertiesandusesof Aluminumandlead.

Glass:Ingredients,propertiestypesanduseinconstruction.

InsulatingMaterials:Thermalandsoundinsulatingmaterial,desirableproperties andtypes of insulating materials.

Unit – III

Componentsofbuilding,areaconsiderations,ConstructionPrincipleandMethods forlayout,Dampproofing,antitermitetreatment in buildings,Verticalcirculationmeans :staircases and their types,designandconstruction.

Differenttypesoffloors,andflooringmaterials(Groundfloorandupperfloors). Bricksandstonemasonaryconstruction.Cavitywallhollowblockconstruction.

Unit- IV

Doors,WindowsandVentilations,Constructiondetails,types of doors and windowsand theirrelative advantages&disadvantages.Types of roofand roof treatments,LintelsandChhajja,

FunctionalefficiencyofBuildings.

Unit-V

NaturalVentilation,WaterSupplyandSanitaryfittings(Plumbing),Electricity. HeatingVentilation&Airconditioning,MechanicalLiftsandEscalators,Fire Fighting,Acoustics.

Plasteringdifferenttypes,pointing,Distempering,Colourwashing,Paintingetc. Principles&Methodsofbuildingmaintenance

References

1.SKDuggal:BuildingMaterials,NewAgeInternational
2.P.C.Varghese:BuildingMaterials,PHI

3.P.C.Varghese:BuildingConstruction,PHI
4.B.C.Funmia:ATextBookofBuildingConstruction,LuxmiPublications,Delhi.
5.O.H.Koenisberger:"Manualoftropicalhousingandbuilding"OrientLongman
6.S.P.Aroraatal.,"ATextBookofBuildingConstruction-DhanpatRai&Sons,

NCE-352 BUILDING MATERIALSLAB

LTP Testing of various properties of following as per BIS specifications
003

I.**Cement**

1.Normal Consistency of cement.
2.Initial & final setting time of cement
3.Compressive strength of cement
4.Finenessofcementbyair permeability and Le-chatalier's apparatus.
5.Soundness of cement.
6.Tensilestrength

II.**Coarse Aggregate**

1.Crushing value of aggregate
2.Impactvalue of aggregate
3.water absorption of aggregate
4.SieveAnalysis of Aggregate
5.Specific gravity &bulk density
6.Grading of aggregates.

III**FineAggregate** :

1.Sieveanalysisofsand
2.Silt content of sand
3.Bulkingofsand

IV **Cement concrete**: Workability tests, compressive strength, Tensile strength

V **Reinforcing Steel :**Tensile and yield strength, Percentage elongation

VI Non destructive testing on concrete

VII Bricks:

1.Waterabsorption.
2.Dimension Tolerances
1Compressive strength
4.Efflorescence

NCE 303 Surveying

L T
2 1

Unit - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors (**2)**

Linear Measurements, Measurement of directions: Reference meridians, bearing and azimuths, Compass, Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control, Electronic Theodolites and Total Station. **(4)**

Unit – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, Automatic level, Digital Level, Vertical Control **(4)**

Contouring: methods and uses, Principles of stadia systems, subtense bar and tangential methods **(2)**

Unit – III

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, triangulation field work **(5)**

Plane table surveying, equipments, methods, resection by three point problem **(2)**

Unit – IV

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves **(5)**

References

1. B. C. Punamia et al: Surveying Vol. I, II
2. A. M. Chandra: Plane Surveying, Higher Surveying
3. S K Duggal: Surveying Vol. I, II
4. R Subramanian : Surveying & Leveling , Oxford University Press
5. C Venkatramaih : Text Book of Surveying , University Press
6. W. Schofield, Mark Breach, Engineering Surveying
7. Charles D. Ghilani, Elementry Surveying

NCE 353 SURVEYING LAB

L T P
0 0 3

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical levelling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method

NCE-354BUILDING PLANNING & DRAWINGLAB.

LTP
003

Drafting of following Using Any CAD software

1.Symbols used in Civil Engineering drawing , Types of Masonry Bonds

*2.*Doors, Windows and staircases.

*3.*Plumbing & Electrical fitting drawings

*4.*Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation & sectional elevation) elevation, plumbing & electrical fillings in out.

*5.*Preparation of Layout plans of different types of Civil Engg. Projects.Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.

NCE-401STRUCTURALANALYSIS–I

LTP
310

Unit–I :

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom per node, Static and Kinematic Indeterminacy for beams, trusses and building frames.[03]
Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.[05]

Unit– II

Rolling loads and influence line diagrams for beams and trusses, Absolute maximum bending moment and shear force.
Muller-Breslau's principal & its applications for determinate structures[08]

Unit – III

Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged parabolic arch, spandrel
braced arch, moving load & influence lines for three hinged arch.[08]

Unit – IV

Strain Energy of deformable systems, Maxwell's reciprocal &Betti's theorem, Castigliano's first theorem, Calculations of deflections: Moment area method, unit load method& Conjugate beam methods for statically determinate beams ,truss and frames.[08]

Unit–V

Unsymmetrical bending in beams, location of neutral axis, computation of stresses and deflection,
Shear Centre its location for common structural sections.[05]
Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.[03]

References

1.Hibbler ," Structural Analysis ", Pearson Education
2.T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
*4.*Reddy,C.S., "Basic Structural Analysis", Tata McGraw Hill.

*5.*Jain,O.P.and Jain, B.K., "Theory & Analysisof Structures ". Vol.I & II Nem Chand.
*6.*Vazirani&Ratwani et al ," Analysis of Strcuctures " , Khanna Publishers
*7.*Coates,R.C.,Coutie,M.G. & Kong, F.K., "Structural Analysis", English Language BookSociety & Nelson, 1980.

NCE-451STRUCTURALANALYSISLAB

LTP
003 Following experiments to be performed

1.To determine Flexural Rigidity (EI) of a given beam
2.To verify Maxwell's Reciprocal theorem.
3.To find horizontal thrust in a three-hinged arch and to draw influence line diagramsfor Horizontal Thrust end Bending moment.
4.To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5.To find deflection of curved members.
6.To find bar forces in a three members structural frames with pin jointed bar
7.To find Critical load in Struts with different end conditions.
8.To find deflections in Beam having unsymmetrical bending.

NCE 402 GEOINFORMATICS

L T P
3 1 0

Unit - I
Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation, Introduction to Digital Photogrammetry.

Unit - II
Remote Sensing: Physics of remote sensing, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC

Unit - III
Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing

Unit - IV
Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications

Unit - V
Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Higher Surveying
3. T M Lillesand et al: Remote Sensing & Image Interpretation
4. B. Bhatta: Remote Sensing & GIS
5. M Anjireddy : Remote Sensing & GIS , BS Publications
6. A. E Rabbany: Introduction to GPS
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad.

NCE 452 GEOINFORMATICS LAB

L T P
0 0 3

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

NCE 403 Hydraulics & Hydraulic Machines

L T P
3 1 0

Unit - I

Difference between open channel flow and pipe flow, geometrical parameters of a channel.

Continuity equation for steady and unsteady flow.

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit – II

Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.

Unit - III

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.

Unit - IV

Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds.

Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.

Unit - V

Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References :

1.Chow,V.T."Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

NCE 453 Hydraulics & Hydraulic Machines LAB

L T P
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc

NCE 454 COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

L	T	P
0	0	3

Write Programs in 'C' Language:

1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-
falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular
form for each of these methods.
2. To implement Newton's Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation
formula
4. To implement Numerical Differentiations & Integration
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness
7. Linear correlation and regression

NCE-404 Engineering Geology

L T P
2 1 0

UNIT I – Study of Rocks:

Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties. **10**

UNIT I I- Study of Minerals:

Physical properties of minerals. Detailed study of certain rock forming minerals. Alkali aggregate reaction. Grouting. Pozzolonic materials. **10**

UNIT III- Rock Deformation & Earthquake

Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration. **10**

UNIT IV- Geophysical Exploration and Geological Investigation:

Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway. **10**

References:

1. D Venkat Reddy: Engg. Geology, Vikas Publication
2. Tony Waltham: Foundations of Engg. Geology, Spon Press
3. Tony Waltham: Foundations of Engineering Geology, SPON Press.
4. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
5. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
6. K V G K Gokhale: Text book of Engineering Geology, B S Publication.
7. Prabin Singh: Engg. and General Geology, Katson Publishing House.
8. D S Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
9. F G Bell: Fundamental of Engineering Geology, B S Publication.
10. Leggot R F: Geology and Engineering, McGraw Hill, New York.
11. P K Mukerjee: A Text book of Geology, Calcuta Word Publishers.
12. B S Sathya Narayanswami: Engineering Geology, Dhanpat Rai & Co.
13. Prakash Rao : Engineering Geology, Nirali Prakashan, Pune.

U. P. TECHNICAL UNIVERSITY,
IET CAMPUS, SITAPUR ROAD, LUCKNOW- 226 021

COURSE STRUCTURE AND SYLLABUS
(EFFECTIVE FROM Session: 2015-16)

B.Tech. (Civil Engineering)

Third Year (5th & 6th Semester)

JULY 10, 2015

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 5th Semester

S.No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
2	NCE 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	NCE 502	Transportation Engineering-1	3	1	0	30	20	50	100	150	4
4	NCE 503	Environmental Engineering-1	2	1	0	15	10	25	50	75	3
5	NCE 504	Structural Analysis-2	3	1	0	30	20	50	100	150	4
6	NCE 505	Design of Concrete Structure-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	NCE 551	Geotechnical Engineering Lab	-	-	3	10	10	20	30	50	1
8	NCE 552	Transportation Engineering Lab	-	-	3	10	10	20	30	50	1
9	NCE 553	CAD Lab-1	-	-	3	10	10	20	30	50	1
10	NCE 554	Estimation Costing & Valuation			3	10	10	20	30	50	1
11	NGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		TOTAL	16	5	12					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 6th Semester

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
2	NCE 601	Design of Concrete Structure-2	3	1	0	30	20	50	100	150	4
3	NCE 602	Environmental Engineering-2	3	1	0	30	20	50	100	150	4
4	NCE 603	Construction Technology & Management	3	1	0	30	20	50	100	150	4
5	NCE 011 -014	Departmental Elective-1	3	1	0	30	20	50	100	150	4
6	NCE 021-024	Departmental Elective-2	2	1	0	15	10	25	50	75	3
PRACTICAL/DRAWING/DESIGN											
7	NCE 651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
8	NCE 652	Environmental Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCE 653	CAD Lab-2	0	0	3	10	10	20	30	50	1
10	NCE 654	Survey Camp*	0	0	0	0	0	50		50	1
11	NGP 601	General Proficiency	0	0	0	0	0	50	-	50	
		TOTAL	16	5	9					1000	25

Note:*The teaching load of survey camp will be counted as equivalent to 0-0-3.

Departmental Elective -1 (Full Unit Course with Credit: 4)

Sl.No.	Code and Course
5 (A)	NCE 011 – Advanced Foundation Design
5 (B)	NCE 012 – Matrix Analysis of Structures
5 (C)	NCE 013 – Environmental Management for Industries
5 (D)	NCE 014 – Principals of Town Planning and Architecture

Departmental Elective – 2 (Half Unit Course with Credit: 3)

Sl.No.	Code and Course
6 (A)	NCE 021 – Advanced Concrete Design
6 (B)	NCE 022 – Earth and Earth Retaining Structure
6 (C)	NCE 023 – Transportation System and Planning
6 (D)	NCE 024 – Rural Water supply and Sanitation

5.2 NCE – 501: GEOTECHNICAL ENGINEERING

L– 3, T– 1, P- 0
CT–30, TA–20, ESE -100

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton' s pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and c-φ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies.
Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & References Books

1. **V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)**
2. **K.R. Arora – Soil Mechanics and Foundation Engineering**
3. **Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.**
4. **Alam Singh – Modern Geotechnical Engineering**
5. **Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning**
6. **I.H. Khan – Text Book of Geotechnical Engineering**
7. **C. Venkataramaiah – Geotechnical Engineering**
8. **Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics**
9. **G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics**
10. **P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.**
11. **Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering**
12. **Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.**

5.3 NCE – 502: TRANSPORTATION ENGINEERING-I

L-3, T-1, P-0

CT-30, TA-20, ESE-100

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR)

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications,

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Book:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.**
2. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**

References:

3. **Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi – 110 006**
4. **Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi**
5. **Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.**
6. **Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.**
7. **Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,**
8. **IRC : 37-2012, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi**

9. IRC: SP:68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
10. IRC: 58-2011, "Guidelines for The design of Plain Jointed Rigid Pavements for Highways", Indian Roads Congress, New Delhi.
11. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
12. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

5.4 NCE – 503 ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1, P -0
CT – 15, TA – 10, ESE – 50

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.
Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.
Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.
Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient

air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books:

1. **Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**
2. **Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.**
3. **Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).**
5. **Seinfeld, J.H. and Pandis, S.N. "Atmospheric Chemistry and Physics: From Air Pollution to Climate Change", John Wiley**
6. **http://cpcb.nic.in/, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.**

References:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
2. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
3. **Steel and McGhee: Water Supply and Sewerage**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Hammer and Hammer Jr.: Water and Wastewater Technology**
6. **Raju: Water Supply and Wastewater Engineering**
7. **Rao: Textbook of Environmental Engineering**
8. **Davis and Cornwell: Introduction to Environmental Engineering**
9. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
10. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
11. **Birdie: Water Supply and Sanitary Engineering**
12. **Ramalho: Introduction to Wastewater Treatment Processes**
13. **Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**

5.5 NCE - 504: STRUCTURAL ANALYSIS-2

L-3, T -1, P-0

CT– 30, TA– 20, ESE- 100

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **Jain, A. K.,"Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.**
2. **Hibbeler, R.C.,"Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309**
3. **C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.**
4. **Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem**
5. **Chand & Bros., Roorkee.**
6. **Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.**
7. **Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.**

8. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
9. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
10. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi..

5.6 NCE - 505: DESIGN OF CONCRETE STRUCTURE-1

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly
Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.
2. The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **IS: 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
4. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
5. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
6. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
7. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**
8. **Sinha, S.N., "Reinforced Concrete Design" Mc-Graw Hill Book Publishing Company Ltd., New Delhi**
9. **Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press,New Delhi – 110 001.**

5.7 NCE – 551: GEOTECHNICAL ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. **Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.**
2. **Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.**
3. **Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.**
4. **Determination of relative density of a given soil sample.**
5. **Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.**
6. **Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).**
7. **Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).**
8. **Determination of compaction characteristics (OMC & MDD) of a given soil sample.**
9. **Determination of permeability of a remolded soil sample by constant head &/or falling head method.**
10. **Determination of consolidation characteristics of a remolded soil sample by an oedometer test.**
11. **Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.**

12. **Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.**

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. **Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.**

5.8NCE – 551: TRANSPORTATION ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

LIST OF EXPERIMENTS

1. **To Determine the Crushing Value of Coarse Aggregates.**
2. **To Determine the Impact Value of Coarse Aggregates.**
3. **To determine the Flakiness Index and Elongation Index of Coarse Aggregates.**
4. **To determine the Los Angeles Abrasion Value of Coarse Aggregates.**
5. **To determine the Stripping Value of Coarse Aggregates.**
6. **To determine the penetration Value of Bitumen.**
7. **To determine the Softening Point of Bituminous material.**
8. **To determine the Ductility Value of Bituminous material.**
9. **To determine the Flash and Fire Point of Bituminous material.**
10. **To determine the Stripping Value of Bituminous material.**
11. **Classified both directional Traffic Volume Study.**
12. **Traffic Speed Study. (Using Radar Speedometer or Enoscope).**
13. **Determination of CBR Value of soil sample in the Lab or in Field.**

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**
2. **Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.**

3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

5.9 NCE - 553: CAD LAB I

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

5.10 NCE - 553: ESTIMATION COSTING & VALUATION

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., "Estimation and Costing in Civil Engineering (Theory and Practice)", UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, "A Text book of Estimation Costing and Valuation" Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., "Estimating Construction Costs" Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

6.2 NCE- 601 DESIGN OF CONCRETE STRUCTURE II

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References

1. **IS : 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete : Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Dayaratnam, P, "Limit State Design of Reinforced Concrete Structures" Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.**
4. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
5. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
6. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
7. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
8. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**

6.3 NCE-602: ENVIRONMENTAL ENGINEERING – 2

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets.

Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc.

Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Other emerging technologies for wastewater treatment: Duckweed pond,

vermiculture, root zone technologies, sequential batch reactor (SBR) etc. Solid waste Management: Definition of solid waste and its classification, Hazardous waste, Prevailing regulations of solid waste management in India. Noise Pollution: Definition, Sources, Prevailing noise standards in India.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

Text books:

1. **Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.**
2. **Metcalf and Eddy Inc.: Wastewater Engineering**
3. **Garg: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).**
5. **Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.**

Reference books:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban**
2. **Development, Government of India, New Delhi**
3. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Arceivala: Wastewater Treatment for Pollution Control**
6. **Hammer and Hammer Jr.: Water and Wastewater Technology**
7. **Raju: Water Supply and Wastewater Engineering**
8. **Sincero and Sincero: Environmental Engineering: A Design Approach**
9. **Pandey and Carney: Environmental Engineering**
10. **Rao: Textbook of Environmental Engineering**
11. **Davis and Cornwell: Introduction to Environmental Engineering**
12. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
13. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
14. **Birdie: Water Supply and Sanitary Engineering**
15. **Ramalho: Introduction to Wastewater Treatment Processes**
16. **Parker: Wastewater Systems Engineering**

6.4 NCE-603: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owing and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira " Construction Planning Equipment and Methods" McGraw Hills Education (India), Private Ltd.,New Delhi.**
2. **Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.**
3. **Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad – 500 004**
4. **Construction Management by Ojha**
5. **Srivastava, U.K.,"Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.**
6. **Construction Technology By Sarkar, Oxford.**

DEPARTMENTAL ELECTIVE – 1 SUBJECT (NCE-011 to NCE-014)

6.5 (A) NCE-011: ADVANCED FOUNDATION DESIGN

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit -1

Modern methods of soil investigations ,Geophysical methods; soil resistivity methods seismic refraction method ,stress below ground due to loads

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmertman's methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour,

Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads ,Machine foundation: classification, definitions, design principle in brief, Barken's method.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & Reference Books:

1. **K. R. Arora – Soil Mechanics & Foundation Engineering.**
2. **Alam Singh – Modern Geotechnical Engineering.**
3. **Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics**
4. **J. E. bowles – Analysis and Design of Foundation.**
5. **V. N. S. Murthy – Soil Mechanics and Foundation Engineering.**
6. **B. M. Das – Foundation Engineering, CENGAGE Learning**

6.5 (B) NCE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE - 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2
Hand computation of problems on trusses, frames and grids.

UNIT – 3
Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Reference:

1. **Weaver & Gere, Matrix Analysis of Framed structures.**
2. **H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill New York**
3. **Pandit, G.S.," Structural Analysis: A Matrix Approach" McGraw Hill Education (India) Pvt. Ltd., Noida.**

6.5(C) NCE – 013: ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw

materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC):Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ.

References:

1. **EIA Manuals of MOEF (Available on http://envfor.nic.in/essential-links/eia-specific-manuals and http://envfor.nic.in/division/introduction-8)**
2. **Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website**
3. **Environmental Impact Assessment-Training resource manual, UNEP 2001**
4. **Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,**
5. **George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.**
6. **Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.**
7. **Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.**
8. **Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi**

6.5 (D) NCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit - 1

Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic arid social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.

Unit - 2

An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.

Unit -3

Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.

Unit - 4

Elements of Architectural Design: Line. Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.

Unit - 5

Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
4. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
5. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
6. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
7. Nelson P. Lewis, Planning to Modern City, Routledge.
8. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
11. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
12. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
13. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi
14. National Building Code of India, latest edition

DEPARTMENTAL ELECTIVE –2 SUBJECT (NCE-021 to NCE-024) (Half Unit Course)

6.6 (A) NCE-021: ADVANCED CONCRETE DESIGN

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit - 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.

Unit - 2

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

Unit - 3

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under-concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab and R.C. T-beam types.

Unit - 4

High performance concrete, Production and no -conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Reinforced Concrete Design by M L Gambhir**
2. **Reinforced Concrete Design by B C Punamia**
3. **Essentials of Bridge Engineering by D.J. Victor**

6.6 (B) NCE- 022: EARTH AND EARTH RETAINING STRUCTURE

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis. Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability

Unit -2

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit - 3

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface-friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -4

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **V N S Murthy - Soil Mechanics and Foundation Engg**
2. **Swami Saran - Reinforced Soil and its Engineering Application**
3. **J. E. Bowles - Analysis and Design of Foundation.**
4. **B. M. Das - Foundation Engineering , CENGAGE Learning**
5. **P.C Varghese- Foundation Engineering, PHI Learning Pvt. Ltd., Delhi**
6. **N.N.SOM, S.C.Das, Theory and Practice of Foundation Design, PHI Learning Pvt. Ltd., Delhi**

6.6 (C) NCE-023: TRANSPORTATION SYSTEM AND PLANNING

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Goals and objective of Transportation planning,

UNIT-2-

Type of transportation system: Different modes of surface transport, Public Transport Intermediate Public Transport (IPT), Rapid and mass transport system like MRTS & bus rapid transit. Traffic Flow and traffic stream theory & variables, Queing theory.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Introduction to Transportation Engineering: William W. Hay.**
2. **Introduction to Transportation Engineering planning- E.K.Mortak.**
3. **Metropolitan Transportation planning-J.W.Dickey.**
4. **Traffic Engineering, L.R. Kadiyali**
5. **Banks, James H., "Introduction to Transportation Engineering", McGraw Education (India), Pvt. Ltd., Noida.**

6.6 (D) NCE-024: RURAL WATER SUPPLY AND SANITATION

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.
Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.**
2. **Operation and maintenance of rural water supply and sanitation systems by Brikké F**
3. **'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.,**
4. **WHO 'Water Supply and Sewerage', by E.W.Steel & T.J.Mcghee, McGraw Hill.**
5. **'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.**

6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

6.7 NCE- 651: STRUCTURAL DETAILING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt. Ltd., Hyderabad.

6.8 NCE-652: ENVIRONMENTAL ENGINEERING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM_{10} with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

Note: Any 8 Experiments out of the list of experiments are to be performed.

References:

1. **A.P.H.A. "Standard Methods for the Examination of Water and Wastewater", American Public Health Association.**
2. **Sawyer, C.N., McCarty, P.L. & Parkin, G.F. "Chemistry for Environmental Engineering", Mc-Graw Hill.**
3. **Mathur, R.P. "Water & Wastewater Testing", Lab Manual, Roorkee.**

6.9 NCE-653: CAD LAB II

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. **Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)**
2. **Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.**
3. **Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)**
4. **Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)**

6.10NCE-654: SURVEY CAMP

TOTAL MARKS: 50

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map.

The course will be run in the form of a camp for 7 working days and will involve the following components:

1. **Reconnaissance of the area to be mapped.**
2. **Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.**
3. **Detail digital mapping using Total station/GPS.**
4. **Preparing a digital map using open source mapping software and report writing.**

Note: Teaching load will be equivalent to 0-0-3.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

OPEN ELECTIVE-I

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

OPEN ELECTIVE-II

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (*λ*), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial

processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI

6. French, R.H., Open channel Hydraulics, McGraw Hill International

7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of

power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford & Haddow's analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. **2**

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. **8**

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme

technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS
2nd Year

[Effective from Session 2014-15]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering
4. B.Tech. Electronics & Instrumentation Engineering
5. B.Tech. Instrumentation & Control Engineering
6. B. Tech. Applied Electronics and Control Engineering
7. B. Tech. Biomedical Engineering

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-III

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031-NOE-039	Engg. Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-IV

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/ NAS-401	Science based Elective/Engg. Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/ NHU-402	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/ AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Syllabus Third semester

THEORY SUBJECTS

NEC-301 NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II.	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III.	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV.	Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.	12.1 to 12.3	6
V.	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.

2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II.	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III.	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	8
IV.	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	8
V.	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books:1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press. 2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.			

NEC-303 SIGNALS AND SYSTEMS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Signals**: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II.	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III.	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV.	**Systems**: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V.	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10

Text Book: P. Ramakrishna Rao, 'Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

Chi-Tsong Chen, 'Signals and Systems', 3rd Ed., Oxford University Press, 2004

V. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

NEC-304 SWITCHING THEORY AND LOGIC DESIGN			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Digital system and binary numbers: Signed binary numbers, binary codes. Gate-level minimization: The map method up to four variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	5
II.	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III.	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	5.1 to 5.5, 5.7 to 5.8 9.1 to 9.7	9
IV.	Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.	6.1 to 6.5 7.1 to 7.3, 7.5to 7.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education			
Reference Books: 1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley. 2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and Principles", CRC Press Taylor & Francis group, 2010.			

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB.

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

Syllabus fourth semester

THEORY SUBJECTS

NEC-401 DATA STRUCTURE		3 1 0
Unit	Topic	Proposed number of Lectures
I.	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	8
II.	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8
III.	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	8
IV.	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	8
V.	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort	8

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI

References

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill
3. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
4. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH
5. G A V Pai, “Data Structures and Algorithms”, TMH

NEC-402 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II.	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III.	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV.	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V.	**Feedback:** The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	7
Text Book: A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Ed.			
Reference Books: Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Ed TMH			

NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II.	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III.	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4,7.5 8.2 to 8.4, 8.9	8
IV.	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4,9.5, 9.7, 9.9, 9.12,10.1, 10.3,10.4, 10.5	8
V.	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2 ,12.3, 13.2, 13.4	8

Text Book: David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.

Reference Books:

Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.

NEC-404 ELECTROMAGNETIC FIELD THEORY			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II.	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III.	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV.	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd			

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective - To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator

Field Effect Transistors-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier

Bipolar Transistors- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.

Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier

Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain.

Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier

Oscillators -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator

Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC- 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW

Syllabus

3rd Year

[Effective from Session 2016-17]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering

SEMESTER-V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501R	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System -I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551R	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab - 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

CT Class Test **AT** Attendance **TA** Tutorial Assignment
ESE End Semester Examination
L/T/P Lecture/ Tutorial/ Practical

SEMESTER-VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC0_	Departmental Elective -I	3	1	0	30	20	50	100	150	4
5	NEC0_	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab - II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654R	Seminar	0	0	1	10	10	20	-	20	1
11	NEC 655	Microcontrollers for Embedded Systems Lab	0	0	1	6	6	12	18	30	1
12	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	26

Departmental Elective –I

1. NEC011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices
5. NEC013R Real Time Systems

Departmental Elective - II

1. NEC 021 Industrial Electronics
2. NEC 022R Microcontroller for Embedded Systems
3. NEC 023 Analog Signal Processing
4. NEC 024R Advance Digital Design using Verilog

NEC 501R Integrated Circuits		
Unit	Topic	Number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press.
2. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, 2nd Edition.

Reference Books:

1. Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Edition, Tata McGraw Hill.
2. Behzad Razavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley.
3. Mark N. Horenstein, "Microelectronic Circuits and Devices", PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf

6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

NEC 502 Principles of Communication		
Unit	**Topic**	**Lectures**
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Needformodulation,Baseband and Pass band signals, Amplitude Modulation: Double side bandwidth Carrier(DSB-C),Double side band without Carrier, Single Side Band Modulation, DSB-SC,DSB-C,SSB Modulators and Demodulators, Vestigial Side Band (VSB),Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	8
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM),PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-Emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops: Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill Publication.

Reference Books:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.Hsu &D.Mitra,"Analog and Digital Communications", Tata McGraw-Hill Publication.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	**8**
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	**8**
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	**8**
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	**8**
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupts controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	**8**

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085",Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill Publication.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer Publication.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson Publication.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill Publication.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson Publication.

NIC 501 Control System -I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
in	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", John Wiley India Publication.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Feedback and Control Systems" Schaums Outlines Series, Tata McGraw Hill Publication.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	**Topic**	**Lectures**
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) QA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	**8**
II	**Point Sources and Their Arrays:** Introduction, Point Source, Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures:** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of *λ/2* Antenna, Array of Two Driven *λ/2* Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	**8**
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	**8**
IV	**Ground Wave Propagation: Plane** Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation: Introduction,** Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics.	**8**

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", Tata McGraw Hill Publication.

Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propogation", Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI Publication.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill Publication.

LABOROTARY

NEC 551R INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for –
    a. Low pass filter of specified cutoff frequency
    b. High pass filter of specified frequency
    c. Band pass filter with unit gain of specified pass band
    d. Design a notch filter to eliminate 50Hz power line frequency
4. Wien bridge oscillator using operational amplifier.
5. Astable and monostable multivibrator using IC 555.
6. Design the following amplifiers:
    a. A unity gain amplifier
    b. A non-inverting amplifier with a gain of 'A'
    c. An inverting amplifier with a gain of 'A'
    d. Log and antilog amplifiers.
    e. Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency 'f'. Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

NIC 551: Control System Lab

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plot unit step response and to find rise time and delay time.
7. Plot locus of given transfer function, locate closed loop poles for different values of k.
8. Plot root locus of given transfer function and to find out S, Wd, Want given root & to discuss stability.
9. Plot Bode plot of given transfer function.
10. Plot Bode plot of given transfer function and find gain and phase margins
11. Plot Nyquist plot for given transfer function and to compare the irrelative stability
12. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain

and phase margin.

Note:-In addition to it, Institutes may include more experiments based on the expertise.

NEC 552: Communication Lab - 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
   a. using switching method
   b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-Uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	**Topic**	**Lectures**
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Microstrip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	**8**
II	Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. Spara meter analysis of all components.	**8**
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	**8**
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit -time devices: IMP ATT Diode, TRAPPAT Diode.	**8**
V	Microwave Measurements: General setup of a microwave testbench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	**8**

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson Education Publication.

Reference Books:

1. R.E Collin, "Foundation for Microwave Engineering", John Wiley India Publication
2. A. Das and S.K. Das," Microwave Engineering", Tata McGraw Hill Publication.

NEC 602 Digital Communication		
Unit	**Topic**	**Lectures**
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques.(QPSK and MSK),M-ary Digital carrier Modulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes.	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	8
IV	Spread Spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	8
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memoryless channel Error Correcting codes: Hamming sphere, Hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	8

Text Book:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press Publication.

Reference Books:

1. H. Taub, D.L. Schilling, G. Saha,"Principles of Communications", McGraw-Hill International Publication.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.HSU and D.Mitra,"Analog and Digital Communications", TataMcGraw-Hill Publication.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor -Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, "VLSI Technology", McGraw Hill Publication.
2. S.K. Ghandhi, "VLSI Fabrication Principles", Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, Practice and Modelling", Pearson Education Publication.
2. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press.

Laboratory

NEC 651 ANTENNA AND MICROWAVE LAB

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator.
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anti-Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient & DC Analysis of NOR Gate inverter.

5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

NEC 655 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

Electives Subjects

NEC 011 Digital Signal Processing		
Unit	**Topic**	**Lectures**
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters:** Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation -In Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, "Digital Signal Processing", PHI Publication.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI Publication.
3. Sanjit K. Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill Publication.
4. Monson Hayes, "Digital Signal Processing", McGraw Hill Education Publication.

NEC 012 Computer Architecture and Organization		
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8

III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.

NEC 013 Artificial Neural Network		
Unit	**Topic**	**Lectures**
I	**Introduction to ANN** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture.	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8

IV	**a)Feedforward neural networks** - - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran , Vijayalakshmi Pari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

NEC-013R REAL TIME SYSTEMS		
Unit	**Topic**	**Lectures**
I	**Introduction to Real Time System** Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8

II	**Embedded Hardware for Real Time System** Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware – On chip Peripherals and Communication protocols** Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART. **Introduction to the CCS IDE:** its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. **Programming:** demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.

3. Hamid A. Toliyat and Steven G. Campbell, "DSP based Electromechanical Motion Control" CRC Press Publication.
4. Jean J Labrosse, "Embedded System Design blocks", CMP books Publication
5. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication.

NEC 014 Advance Semiconductor Devices		
Unit	**Topic**	**Lectures**
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator - Semiconductor Capacitors.	**8**
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	**8**
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	**8**
IV	Transferred-Electron and Real-Space-Transfer Devices Thyristors and Power Devices **Photonic Devices and Sensors:** Radioative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	**8**
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. Sensors: Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	**8**

Text Book:

1. S. M. Sze, Kwok K. NG, "Physics of Semiconductor Devices", Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	**Topic**	**Lectures**
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor -Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	**8**
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	**8**
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	**8**
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	**8**

Text Books:

1. M. H. Rashid, "Power Electronics", Pearson Education Publication.

Reference Books:

1. M. D. Singh & K. Khanchandani, "Power Electronics", Tata McGraw Hill Publication.
2. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press,
3. M.S. Jamil Asghar, "Power Electronics", PHI Publication.

NEC 022R Microcontrollers for Embedded Systems		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers.	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	8
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and Mc Kinlay Rolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide..

NEC 023 Analog Signal Processing		
Unit	**Topic**	**Lectures**
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: null or, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω0), frequency response, effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R. Schaumann and M.E. Valkenberg," Design of Analog Circuits", Oxford University

NEC 024R Advanced Digital System Design using Verilog		
Unit	**Topic**	**Lectures**
I	**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools. **Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.	8
II	**Gate Level Modeling:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits. **Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.	8

III	**Behavioral Modeling:** Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow if and if-else constructs, Assign-De-Assign construct, Repeat construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event. **Switch Level Modeling:** Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.	8
IV	**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives. **Sequential Circuit Description:** Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.	8
V	**Components Test and Verification:** Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification. Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems.	8

Text Books:

1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL", Wiley Publication.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH Publication.
3. Richard F. Tinder, "Engineering Digital Design", Academic Press Publication.

Reference Books:

1. Stephen. Brown and Zvonko Vranesic," Fundamentals of Logic Design with Verilog Design", TMH Publication.
2. Sunggu Lee ,"Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA ", Cengage Learning Publication.
3. Samir Palnitkar , "Verilog HDL", 2nd Edition, Pearson Education Publication.
4. Michael D. Ciletti , "Advanced Digital Design with Verilog HDL ", PHI Publication.
5. Parag K. Lala, "Digital System Design Using PLDs", PHI India Ltd.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins," Carrier-Grade VoIP", McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, "IP Telephony – Deploying Voice Over-IP Protocols", John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

NEC 041 ELECTRONIC SWITCHING		3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication Switching Systems and Networks", PHI.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Electrical and Electronics Engineering

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Third Year

Semester-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501	Elements Of Power System	3	1	0	30	20	50	100	150	4
2	NEE 502	Power Electronics	3	1	0	30	20	50	100	150	4
3	NEE-503	Control System	3	1	0	30	20	50	100	150	4
4	NEE-504	Microprocessor & Its Applications	3	1	0	30	20	50	100	150	4
5	NEC-508	Fundamentals of E.M. Theory	2	1	0	15	10	25	50	75	3
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551	Power Electronics Lab	0	0	3	10	10	20	30	50	1
8	NEE 552	Control System Lab	0	0	3	10	10	20	30	50	1
9	NEE-553	Microprocessor Lab	0	0	2	10	10	20	30	50	1
10	NEE 554	Simulation Based Minor Project	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	1
		TOTAL	16	5	10					1000	26

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Third Year

Semester-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601	Power System Analysis	3	1	0	30	20	50	100	150	4
2	NEE 602	Switchgear & Protection	3	1	0	30	20	50	100	150	4
3	NEN-603/ NEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
4	NEN-011-NEN-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
5	NEN-021-NEN-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEC-651	IC Lab	0	0	2	10	10	20	30	50	1
8	NEN-652	Electrical & Electronics CAD Lab	0	0	3	10	10	20	30	50	1
9	NEN-653	Minor Project	0	0	2	10	10	20	30	50	1
10	NEN- 654	Seminar	0	0	3		50	50		50	1
11	NGP-601	GP						50		50	1
		TOTAL	16	5	10					1000	26

Elective-I

NEN – 011: Digital Control System
NEN – 012: Fundamentals of Digital Signal Processing
NEN – 013: Neural Networks and Fuzzy System
NEN – 014: Special Electrical Machine

Elective-II

NEN – 021: VLSI Design
NEN – 022: Wireless Communication
NEN – 023: Antenna and Wave Propagation
NEN – 024: Mechatronics

Annexure-III

NEE-501: ELEMENTS OF POWER SYSTEM

L T P
3 1 0

Unit-I

Power System Components:

Single line Diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System

Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:

Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.Proximity effect

Unit-II

Over Head Transmission Lines

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

Unit-III

Corona and Interference:

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

Unit-IV

Mechanical Design of transmission line:

Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables:

Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit-V

Neutral grounding:

Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line:

Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission:

Introduction to EHV AC and HVDC transmission lines.

Text Books

1.W. D. Stevenson, “Element of Power System Analysis”, McGraw Hill,

2.C. L. Wadhwa, “Electrical Power Systems” New age international Ltd. Third Edition

3.Asfaq Hussain, “'Power System”, CBS Publishers and Distributors,

4.B. R. Gupta, “Power System Analysis and Design” Third Edition, S. Chand & Co.

5.M. V. Deshpande, “Electrical Power System Design” Tata Mc Graw Hill.

Reference Books

6.Soni, Gupta & Bhatnagar, “A Course in Electrical Power”, Dhanpat Rai & sons,

8.S.N.Singh, “ Electric Power Generation, Transmission& distribution.” PHI Learning

NEE-502:POWER ELECTRONICS

L T P
3 1 0

Unit-I

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics, specifications of switches, types of power electronic circuits, Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT

Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC

Unit-II

Power Semiconductor Devices (Contd.)

Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers and their various applications.

Unit-III

Phase Controlled Converters

Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters. Performance Parameters

Three phase half wave converters, three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls

Single phase ac voltage controller with resistive and inductive loads

Three phase ac voltage controllers (various configurations and comparison only)

Single phase transformer taps changer, industrial applications.

Cyclo Converters

Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation and their applications.

Unit-V

Inverters

Single phase series resonant inverter,Single phase bridge inverters,Three phase bridge inverters

Voltage control of inverters,Harmonics reduction techniques,Single phase and three phase current source inverters

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005
3. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press.

Reference Books:

4. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics &Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008.
7. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

NEE-503: CONTROL SYSTEM

L T P
3 1 0

Unit-I

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit-II

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit-III

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor

Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique:

The root locus concepts, construction of root loci

Unit-IV

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain:

Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles

Unit-V

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:

Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, " Control Systems theory and Applications", Pearson Education

NEE-504: MICROPROCESSORS

L T P
3 1 0

UNIT-I:

Introduction to Digital Computer and Microprocessor:

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II:

8-bit Microprocessors.

8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III:

16-bit Microprocessors: Architecture:

Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes**:** Instruction format:

Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types.

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V

Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter.

8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications with the 8085" Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, "Microcomputers and Microprocessors" PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing" Tata Mc. Graw Hill.

4. Krishna Kant, “Microprocessors and Microcontrollers” PHI Learning.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata McGraw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. N. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford University Press.
11. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family” Prentice Hall (India)

NEC-508: FUNDAMENTALS OF E.M.THEORY

L T P
2 1 0

Unit I
Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation,divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density,Energy and potential.

Unit-II
Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations.

Unit-III
Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

Unit-IV
Uniform Plane waves, Plane wave reflection and dispersion

Text Books:

1. Hayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata McGraw Hill Publishing
2. Mathew Sadiku, "Electromagnetic Field Theory", Oxford University Press.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
4. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition.
5. Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition

NEE-551: POWER ELECTRONICS LABORATORY

L T P
0 0 3

Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.
17.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” Prentice hall Inc.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media,

NEE– 552: CONTROL SYSTEM LABORATORY

L T P
0 0 2

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

10. To simulate PID controller for transportation lag.
11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

NEE-553: MICROPROCESSOR LABORATORY

L T P
0 0 2

A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

NEE-601: POWER SYSTEM ANALYSIS

L T P
3 1 0

Unit-I

Representation of Power System Components:

Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II

Symmetrical fault analysis:

Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unsymmetrical faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations

Unit-III Load Flows:

Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations,

load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV

Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Unit-V Traveling Waves:

Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

NEE – 602: SWITCHGEAR AND PROTECTION

L T P
3 1 0

Unit I:

Introduction to Protection System:

Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

Unit-II:

Relay Application and Characteristics:

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:

Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III

Protection of Transmission Line:

Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

Unit-IV:

Circuit Breaking:

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:

Classification, testing station and equipments, testing procedure, direct and indirect testing

Unit-V

Apparatus Protection:

Protection of Transformer, generator and motor.

Circuit Breaker:

Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, “Fundamentals of Power System Protection”, Prentice Hall of India.
5. T.S.M Rao,“Power System Protection: Static Relays with Microprocessor Applications” Tata Macgraw Hill”.
6. A.R. Van C. Warringtaon , “ Protective Relays- Their Theory and Practice, Vol. I & II” Jhon Willey & Sons.

NEN-603/EEC 501: Integrated Circuits

L T P
3 1 0

EEC 501 INTEGRATED CIRCUITS

Unit-I

Analog Integrated circuit Design: an overview: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror.

The 741 IC Op-Amp: Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR. **8**

Unit-II

Linear Applications of IC op-amps: An Overview of Op-Amp (ideal and non ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors.

Filters: First and second order LP, HP, BP BS and All pass active filters, KHN, Tow-Thomas and State Variable Biquad filters; Sinusoidal oscillators. **8**

Unit-III

Digital Integrated Circuit Design-An Overview: CMOS Logic Gate Circuits: Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates.

Latches and Flip flops: The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits. **8**

Unit-IV

Non-Linear applications of IC Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multivibrator, Monostable multivibrator, Generation of Triangular Waveforms. **8**

Unit-V

D/A and A/D converters Integrated Circuit Timer: The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator Using the 555 IC.

Phase locked loops (PLL): Ex-OR Gates and multipliers as phase detectors, Block Diagram of IC PLL, Working of PLL and Applications of PLL. **8**

Text Book:

[1] Sedra and Smith, “Microelectronic Circuits”, Oxford University Press.

Reference Books:

[2] Michael Jacob, `Applications and Design with Analog Integrated Circuits’, PHI, 2006.
[3] Jacob Milliman and Arvin Grabel, “Microelectronics”, TMH, 2008.

DEPARTMENTAL ELECTIVES

ELECTIVE – I

NEE – 011/NEN-011: Digital Control System

L T P
3 1 0

UNIT-I

Signal Processing in Digital Control:

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample- hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II

Design of Digital Control Algorithms:

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

UNIT-III

State Space Analysis and Design:

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

UNIT-IV

Stability of Discrete System:

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

UNIT-V

Optimal digital control :

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System",Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems:Theory, hardware, Software",Mc Graw Hill.

NEE – 012/NEN-012: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

L T P
3 1 0

Unit-I

Discrete-Time Signals And Systems:

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Discrete Fourier Transform:

Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit-II

Sampling of Continuous Time Signals:

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III

Transform Analysis of LTI Systems:

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase

Overview of finite precision numerical effects, effects of coefficient quantization,Effects of round-off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

Unit-IV

Filter Design Techniques:

Design of D-T IIR filters from continuous – time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation

Unit-V

Efficient computation of the DFT:

Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier Analysis of Signals Using DFT :

DFT analysis of sinusoidal signals, time-dependent Fourier transforms: Block convolution, Fourier analysis of non – stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. & Manolakis, D.G.,” Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall of India.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, Prentice Hall of India.
5. Oppenheim, Alan V. & Willsky, Alan S. , “Signals and Systems” , Prentice Hall of India, 2nd Edition
6. Johnson, J.R. , “Introduction to Digital Signal Processing”, Prentice Hall of India.

NEE – 013/NEN-013: NEURAL NETWORKS AND FUZZY SYSTEM

L T P
3 1 0

Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule,
Auto-associative and hetro-associative memory

Unit-II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.

Reference Books:

3. Siman Haykin, “Neural Netowrks” Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

NEE-603/NEN -014: SPECIAL ELECTRICAL MACHINE

L T P

3 1 0

UNIT-I

Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power)

UNIT-II

Single phase Induction Motors:

Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor-start capacitor-run and shaded pole motors.

Two Phase AC Servomotors:

Construction, torque-speed characteristics, performance and applications.

UNIT-III Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:

Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT-IV

Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V

Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “ Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001
3. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987
5. M.G. Say “ Alternating current Machines” Pitman & Sons .

DEPARTMENTAL ELECTIVES
ELECTIVE – II

NEN-021 : VLSI DESIGN

L T P
2 1 0

UNIT-I

Introduction to integrated circuit technology. CMOS fabrication, the p-well process, n-well process, twin tub process. Bi-CMOS technology. Basic electrical properties of MOS circuits, Ids-Vds relationship, MOS transistor threshed voltage Vt, Transconductance and output conductance, MOS transistor figure of merit.

UNIT-II

The n-MOS inverter, pull-up to pull-down ratio, CMOS inverter and its characteristics, latch –up in CMOS circuits, stick diagrams, n-MOS design style,CMOS design style, lambda based design rules , Body effect, sheet resistance,capacitances of layers, Gate delays, Delay estimation, logical efforts, Scaling modelsand scaling factors, limitation of scaling, , Limits of miniaturization.

UNIT-III

n-MOS, CMOS NAND Gates, n-MOS, CMOS NOR gates. Combinational circuit design, sequential circuit design, design considerations, problems associated with VLSI Design, Design Methodology and Tools, Standard Cell Based Design, Design Flows, Automated Layout Generation, Placement, Floor planning, Routing, Parasitic Extraction, Timing Analyses.

UNIT-IV

Full Custom Design, Semi Custom Design, Programmable Logic structures, Field Programmable Gate arrays (FPGA) , Configurable Logic Block (CLB), Application-Specific Integrated Circuits (ASICs)

UNIT-V

Design for Testability, Faults types and Models, Controllability and Observability, AD HOC Design Techniques, Scan-Based Techniques, Built-In self Test (BIST),Techniques, Current Monitoring IDDQ Test. Packaging, Package Parasitic, Heat dissipation, Design Economics, Parametric yield.

Text Books:

1. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Prentice-Hall of India.
2. CMOS VLSI Design, A Circuits and Systems Perspective by Neil H.E. Weste, David Harris, Ayan Banerjee, Pearson Education.
3. CMOS Digital Integrated Circuits Analysis and Design by Sung-Mo Kang, Yusuf Leblebici. Tata Mc-Graw-Hill.

References:

4. Digital Integrated Circuits A Design Perspective by Jab M. Rabaey, Anantha Chandra kasan, Borivoje Nikolic, Prentice-Hall of India Pvt. Limited.
5. Principles of C-MOS VLSI Design A systems Perspective by Neil H.E. Weste, Kamrau Eshraghian, Pearson Education
6. Application-Specific Integrated Circuits by Michal John Sebastian smith, Pearson Education..

NEN -022: WIRELESS COMMUNICATION

L T P
2 1 0

Unit-I
Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design usingpath loss model. Small scale fading & multi-path propagation and measurements, impulse response model and parameters of multi-path channels, types of fading, theory of multi-path shape factor for fading wireless channels.

Unit-II
Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FH-SS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multi-path channels,fundamentals of equalization, equalizer in communication receiver, survey of equalization techniques, linear equalizer, linear equalizer, non-linear equalizations, diversity techniques,RAKE receiver.

Unit-III
Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, time division multiple access, space division multiple access, and frequency division multiple access.

Unit-IV
Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.

Text Book:
1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson

Reference Books:
1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin S & Moher M., “Modern wireless communication”, Pearson, 2005
4. R. Pandya, “ Mobile and personal communication system”, PHI.

NEN -023 ANTENA AND WAVE PROPOGATION

L T P
2 1 0

UNIT-I

Antena Principles: Potential functions & Electromagnetic field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance.
Network Theorems
Directional Properties of Dipole Antenna.
Antenna Gain, Effective Area, Antenna Terminal impedance, Practical Antennas and Methods of Excitation, Antenna Temperature and Signal. To Noise Ratio.

UNIT-II

Antenna Arrays: Two Element Array, Horizontal Patterns in Broadcast Arrays, Linear Arrays, Multiplication of Patterns, effect of the earth on vertical patterns, Binomial array.

UNIT-III

Wave Propagation: Modes of Propagation, Plane Earth Reflection. Space
wave and Surface Wave, Reflection and refraction waves by the lonosphere Tropospheric Wave.
Ionosphere Wave Propagation in the Inosphere , Virtual Height , MUF Critical frequency, Skip Distance, Duct Propagation, Space wave.

UNIT-IV

Practical Antenas:
VLF and LF tranmitting antennas, effect of antenna height, Field of short dipole, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, Directivity of Circular loop antenna with uniform current, Yagi-Uda array: Square corner yagi-uda hybride, circular polarization
Rhombic Antenna Weight and Leg length
Parabolic Reflectors Properties, Comparison with corner reflectors
Horn Antenna: Length and Aperture.
Introduction to Turstile Antenna
Effect of ground on antenna performance.
Broadband Antenna: Frequency independent concept, RUMSEY'Ss Principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral Antenna.

Text Books:

1. Jordan Edwards C. and Balmain Keith G./ "Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)
2. Kraus, JohnD & Mashefka, Ronald J. / "Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.

Reference Books:

1. Prasad, K.D./ "Antennas and Wave Propagation" /Khanna Publications.
2. Collin, R./ "Antennas and Radiowave Propagation" /Tata McGraw-Hill
3. Hayt Jr. William H./ "Engineering Electromagnetics"/Tata McGraw-Hill.
4. Das, Annaparna & Das, Sisir K. / "Microwave Engineering"/Tata McGraw Hill.
5. Roy, Sitesh Kumar & Mitra, Monojit / "Microwave Semiconductor Devices" / Prentice Hall (India).

NEN -024: MECHATRONICS

L T P
2 1 0

1. Mechatronics and its scope:
Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level. Signal conditioning amplification, filtering & data acquisition.

2. Pneumatic and Hydraulic actuation systems:
Directional control valves, pressure control valves and cylinders. process control valves. Mechanical
actuation system-kinematic chains, cams, gear trains. Ratchet & Pawl, dampers, bearings. Electrical actuation system. Mechanical switches- solenoid operated solid state switches, DC, AC & stepper motors.
Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.

3. Elements of Microprocessors & Microcontrollers, Programmable **logic controllers &** Communication
interface.

4. Case Studies of Mechatronic Systems:
Industrial Robot and its control
Automobile Engine Control
Electromechanical disc-control.

5. Vehicle suspension Control:
Micro mechanical systems. Computer Printer, VCR, Fax Machine, NC Machine.

References:
1. Rolf Isennann, " Mechatronics Systems", Springer, 2005.
2. W. Bolten, "Mechatronics", Pearson Education 2003.
3. HMT Ltd, "Mechatronics:, Tata McGraw Hill 1998.

NEC– 651: IC LAB

L T P
0 0 3

INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for:
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostable multivibrator using IC 555.

NEN=652: ELECTRICAL and ELECTRONICS CAD LAB

L	T	P
0	0	3

1. Design of Single phase transformer.
2. Design of Single phase Induction Motor.
3. Design of DC motor.
4. Design of DC generator.
5. Design of Single phase alternator.
6. Design of Synchronous Motor.
7. Design of lag, lead and lag-lead compensator.
8. Design of PI & PD Controller.
9. Design of PID controller.
10. Design of Analog Filter
11. Design of Self-tuned filter.
12. Design of voltage controller Oscillator
13. Design of DC-DC converter.

Text Books:-

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.

Dr. APJ ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Fourth Year **Semester-VII**

S.NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEN701	ELECTRIC DRIVES	3	1	0	30	20	50	100	150	4
2	NEN702	POWER STATION PRACTICE	3	1	0	30	20	50	100	150	4
3	NEC702A	ANALOG & DIGITAL COMMUNICATION	3	1	0	30	20	50	100	150	4
4	NEN031 to 033, NCS039	DEPARTMENTAL ELECTIVE-III	3	1	0	30	20	50	100	150	4
5	NOE071 to 074	OPEN ELECTIVE-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
6	NEN751	POWER SYSTEM LAB	0	0	3	10	10	20	30	50	1
7	NEC752B	ADC LAB	0	0	3	10	10	20	30	50	1
8	NEN753	INDUSTRIAL TRAINING	0	0	2	30	20	50	--	50	1
9	NEN754	PROJECT	0	0	2	30	20	50	--	50	1
10	NGP701	GP					50	50		50	1
		TOTAL	16	5	10					1000	24

LIST OF DEPARTMENTAL ELECTIVE-III

NEN-031 POWER SYSTEM OPERATION AND CONTROL
NEN-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEN-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I

NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATIONS RESEARACH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY

PROPOSED STUDY AND EVELUATION SCHEME OF ELECTRICAL & ELECTRONICS ENGINEERING

Fourth Year **Semester-VIII**

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE801	ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS	3	1	0	30	20	50	100	150	3
2	NEC802	EMBEDDED SYSTEM	3	1	0	30	20	50	100	150	4
3	NEE041 to 042; NEN043 to 044	DEPARTMENTAL ELECTIVE-IV	3	1	0	30	20	50	100	150	4
4	NOE081 to 082; NOE084 to 085	OPEN ELECTIVE-2	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEN851	PROJECT	0	0	12	0	100	100	250	350	8
6	NGP801	GP					50	50		50	1
		TOTAL	14	5	12		180	350	650	1000	24

LIST OF DEPARTMENTAL ELECTIVE IV

NEE041 EHVAC&DC TRANSMISSION
NEE042 POWER QUALITY
NEN043 IMAGE PROCESSING
NEN044 SATELLITE COMMUNICATION

LIST OF OPEN ELECTIVE 2

NOE081 NON-CONVENTIONAL ENERGY RESOURCES
NOE082 NON LINEAR DYNAMIC SYSTEMS
NOE084 AUTOMATION & ROBOTICS
NOE085 DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

NEE701/NEN 701: Electric Drives

L T P
3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation

Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited DC motor drives (continuous conduction only), dual converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited DC motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive:

Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor:

Self controlled scheme

Special Drives:

Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K. Pillai, “A First Course on Electric Drives”, New Age International.
3. B.N. Sarkar, “Fundamental of Industrial Drives”, Prentice Hall of India Ltd.

Reference Books:

1 M. Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V. Subrahmanyam, “Electric Drives: Concepts and Applications”, TataMcGraw Hill.

NEE 702/NEN702: POWER STATION PRACTICE

L T P
3 1 0

UNIT-I:Introduction: Electric energy demand and growth in India, electric energy sources.
Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.
Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.
Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.
Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.
Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V:Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:
1. B.R. Gupta, “Generation of Electrical Energy”, S. Chand Publication.
2. Soni, Gupta & Bhatnagar, “A text book on Power System Engg.”, Dhanpat Rai & Co.
3. P.S.R. Murthy, “Operation and control of Power System” BS Publications, Hyderabad.

Reference Books:
4. W. D. Stevenson, “Elements of Power System Analysis”, McGraw Hill.
5. S. L. Uppal, “Electrical Power”, Khanna Publishers.

NEC702A: Analog & Digital Communication

L T P
3 1 0

UNIT I:
Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:
Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:
Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:
Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:
Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:
1. Simon Haykin," Communication Systems" John Wiley & Sons 4th Edition
2. G.Kennedy and B. Davis," Electronic Communication Systems" 4th Edition, Tata McGraw Hill
3. Simon Haykin, "Digital Communications" John Wiley & Sons
4. T.L. Singal, "Analog & Digital Communication", Tata Mc Graw Hill

Reference Books:
1. B.P. Lathi, "Modern Analog & Digital Communication Systems" Oxford University Press.
2. Taub & Schilling, "Communication System: Analog and Digital" Tata Mc Graw Hill
3. R.P. Singh & S.D. Sapre, "Communication Systems Analog and Digital" Tata McGraw Hill.

NEE –031/NEN-031: POWER SYSTEM OPERATION AND CONTROL

L T P
3 1 0

UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
1. D.P. Kothari & I.J. Nagrath, “Modern Power System Analysis” Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, “Operation and control in Power Systems” B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, “ Understanding FACTs” Concepts and Technology of Flexible AC Transmission Systems”
4. A. J. Wood & B.F. Wollenburg, “ Power Generation, Operation and Control “ John Wiley & Sons.
Reference Books:
1. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
2. P. Kundur, “ Power System Stability and Control Mc Graw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza,’ Power System Analysis’ Oxford University Press.

NEE-032/NEN032:
ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P
3 1 0

Unit-I: Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.
16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:
1. Ray, A.K. & Burchandi, K.m., "Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing" Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, "Advanced Microprocessors and Microcontrollers" New Age International.
3. Krishna Kant,"Microprocessors and Microcontrollers" PHI Learning.
4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.

Reference Books:
1. Ayala, "The 8051 Micro Controller", Centage Learning.
2. Mazidi M.A., Maizidi J.G. Mckinlay R.D., "The 8051 Microcontroller and Embedded Systems" Pearson Education.
3. Rajkamal, "The concept and feature of microcontrollers 68HC11, 8051 and 8096", S.Chand Publisher, New Delhi
4. Peatman John, "Design with microcontroller", Mc.-Graw Hill Publishing.

NEE033/NEN-033: FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications
Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications
Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV: Voltage Source Converter Based Facts Controllers
Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability. SSSC-operation of SSSC and the control of power flow – modelling of SSSC in load flow and transient stability studies.

TEXT BOOKS:
1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor – Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:
1. A.T. John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE) 1999.
2. V.K. Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System: Modelling and Control" Springer, 2012.

NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

L T P
3 1 0

Unit-I
Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II
Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III
Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV
Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation. Translating object oriented design into implementations.

Unit-V:
Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

Text Books:
1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das “Unix concepts & application” TMH

Reference Books:
1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis.

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication.

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

NEN – 751: POWER SYSTEM LAB

L T P
0 0 3

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (xd) and quadrature axis reactance (xq) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (xd) and sub transient quadrature axis reactance (xq) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

(B) Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata McGraw Hill.
2. T.K. Nagsarskar & M.S. Sukhija, Power System Analysis’ Oxford University Press.

NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

L T P
0 0 2

Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.

NEE801: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

L T P
3 1 0

UNIT – I

Crystal Structure of Materials:

A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth

B. Energy bands in solids, classification of materials using energy band.

UNIT – II

Conductivity of Metals:

Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III

Mechanism of Conduction in semiconductor materials:

Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV

Magnetic Properties of Material:

Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :

1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S. Chand & Co.

References :

1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2 Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
4 T. K. Basak, "Electrical Engineering Materials" New age International.

NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:
1. H.Kopetz, “Real-Time Systems”, Kluwer
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

NEE – 041: EHV AC & DC TRANSMISSION

L T P
3 1 0

UNIT-I:Introduction :
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:EHV AC Transmission :
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.
Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters,
Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :
1.R. D. Begamudre, “Extra High Voltage AC Transmission Engineering” Wiley Eastern.
2.K. R. Padiyar, “HVDC Power Transmission Systems: Technology and System Reactions” New Age International.
3.J. Arrillaga,“ High Voltage Direct current Transmission” IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, “High Voltage Engineering” Tata Mc Graw Hill.
Reference Books:
5.M. H. Rashid , “ Power Electronics : Circuits, Devices and Applications” Prentice Hall of India.
6.S. Rao, “EHV AC and HVDC Transmission Engineering and Practice” Khanna Publisher.
7.“EPRI, Transmission Line Reference Book, 345 KV and above” Electric Power Research Institute. Palo Alto, California, 1982.

NEE-042: POWER QUALITY

L T P
3 1 0

Unit-I

Introduction to Power Quality:

Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations**.**

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients-motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices-Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “ Power Quality” CRC Press.

NEN -043: IMAGE PROCESSING

L T P
3 1 0

UNIT-I

Image:

Image formation, image geometry perspective and other transformation, sterio imaging elements of visual perception Digital Image-sampling and quantization serial & parallel Image processing

UNIT-II

Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their properties, filters, correlators and convolvers Image enhancement-Contrast modification, Histogram specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour enhancement

UNIT-III

Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.

UNIT-IV

Segmentation Techniques-thresholding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications

UNIT-V

Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, skelton detection, Hough transform, topological and texture analysis, shape matching.
Practical Applications – Finger print classification, signature verification, text recognition, map understanding, bio-logical cell classificaton.

Text Books:

1. Ganzalez and Wood, “Digital Image Processing”, Addison Wesley, 1993.
2. Anil K.Jain, “Fundamental of Image Processing”, Prentice Hall of India

References:

1. Rosenfeld and Kak, “Digital Picture Processing” vol. I & vol. II, Academic,1982
2. Ballard and Brown, “Computer Vision”, Prentice Hall, 1982
3. Wayne Niblack, “An Introduction to Digital Image Processing”, Prentice Hall, 1986
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publications.

NEN-044 : SATELLITE COMMUNICATION

L T P
3 1 0

UNIT-I
Elements of Satellite Communication Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

UNIT-II
Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

UNIT-III
Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM. Multiple access: FDMA, TDMA, DAMA and CDMA.

UNIT-IV
Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolutional codes, linear and cyclic block codes. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.

UNIT-V
Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.

Text Books:
1. Satellite Communications / Pratt, Bostian, Allnutt / John Wiley & Sons.
2. Satellite Communications / Dennis Roddy / McGraw-Hill
3. Digital Satellite Communications/ Tri T. Ha./ McGraw-Hill.

OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I :Introduction : Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II :Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III :Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV :Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V :Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations.
Waste Recycling Plants.

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford University Press.

NOE-082: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity. Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos.

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” McGraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automation” Wily Eastern.

NOE-085: DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

L T P
3 1 0

Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, data definitions language, DML, overall database structure.

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV: Foundation. Introduction to DATA Warehousing. Client / Server Computing model & Data Warehousing. Parallel processors & System. Distributed DBMS implementations. Client /Server RDBMS Solutions.

Unit-V: DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools. Metadata.

Data Mining: Introduction to data mining

Text Books:

1. Korth, Silbertz, Sudarshan, Database Concepts., Mc Graw Hill
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.
4. Mallach, Data Warehousing System., Mc. Graw Hill

Reference Books :

1. Elmasri, Navathe, Fundamentals of Database Systems., Addition Wesley
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
3. Majumdar & Bhattacharya, Database Management System., Tata Mc Graw Hill
4. Ramakrishnan, Gehrke, Database Management System., Mc Graw Hill.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Information Technology

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NIT 501	Management Information System	2	1	0	15	10	25	50	75	3
6	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language Lab	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NIT 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NIT 061: Information Retrieval and Management
2. NIT 062: Modeling & Simulation
3. NIT 063: Bioinformatics
4. NIT 064: Knowledge based & decision Support System
5. NIT 065: Geographic Information System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 070: Human Computer Interface
3. NIT 066: E-Business Strategies
4. NCS 067: Distributed Database
5. NIT 067: Big Data

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures*:*** Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.

2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.

3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997

4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.

5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.

6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date
C J, " An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin
C. Desai, " An Introduction to Database Systems", Gagotia Publications 3.
Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NIT 501 MANAGEMENT INFORMATION SYSTEMS		2 1 0
Unit	Topic	Proposed Lectures
I	**Foundation of Information Systems**: Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.	8
II	**An overview of Management Information Systems**: Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Concept of an MIS,Structure of a Management information system.	8
III	**Concepts of planning**: Concept of organizational planning, The Planning Process, Computational support for planning. Business applications of information technology: Internet & electronic commerce and its applications Enterprise Solutions, Information System for Business Operations(SDLC),Information System for Strategic Advantage,Decision Support Systems and its benefits and characterstics.	8
IV	**Managing Information Technology**: Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes. Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.	8

TEXT BOOK:

1. O Brian, “Management Information System”, TMH
2. Gordon B. Davis & Margrethe H. Olson, “Management Information System”, TMH
3. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley.

REFRENCE BOOKS:-

1. O Brian, “Introduction to Information System”, MCGRAW HILL.
2. Murdick, “Information System for Modern Management”, PHI.
3. Jawadekar, “ Management Information System”, TMH.
4. Jain Sarika, “Information System”, PPM
5. Davis, “Information System”, Palgrave Macmillan

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return x^2 -y^2 , otherwise y^2 - x^2)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS):**Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management:**Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8
	Textbooks: 1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill. 2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication. 3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers. 4. Pankaj Jalote, Software Engineering, Wiley 5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.	

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.

2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.

3.Henk Alblas and Albert Nymeyer,"Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

	NIT-061 Information Retrieval and Management	3 1 0
Unit	Topic	Proposed Lectures
I	Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. Automatic Text Analysis, Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing, Automatic Classification. Measures of Association, Different Matching Coefficient, Classification Methods, Cluster Hypothesis. Clustering Algorithms, Single Pass Algorithm, Single Link Algorithm, Rochhio's Algorithm and Dendograms	8
II	File Structures, Inverted file, Suffix trees & suffix arrays, Signature files, Ring Structure, IR Models, Basic concepts, Boolean Model, Vector Model, and Fuzzy Set Model. Search Strategies, Boolean search, serial search, and clusterbased retrieval, Matching Function. Performance Evaluation- Precision and recall, alternative measures reference collection (TREC Collection), Libraries & Bibliographical system- Online IR system, OPACs, Digital libraries - Architecture issues, document models, representation & access, Prototypes, projects & interfaces, standards	8
III	Taxonomy and Ontology: Creating domain specific ontology, Ontology life cycle Distributed and Parallel IR: Relationships between documents, Identify appropriate networked collections, Multiple distributed collections simultaneously, Parallel IR - MIMD Architectures, Distributed IR – Collection Partitioning, Source Selection, Query Processing	8
IV	Multimedia IR models & languages- data modeling, Techniques to represent audio and visual document, query languages Indexing & searching- generic multimedia indexing approach, Query databases of multimedia documents, Display the results of multimedia searches, one dimensional time series, two dimensional color images, automatic feature extraction.	8
V	Searching the Web, Challenges, Characterizing the Web, Search Engines, Browsing, Mata searchers, Web crawlers, robot exclusion, Web data mining, Metacrawler, Collaborative filtering, Web agents (web shopping, bargain finder), Economic, ethical, legal and political issues..	8

Text Books :

1. Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6
2. I. Witten, A. Moffat, and T. Bell, “Managing Gigabytes” 4. D. Grossman and O. Frieder “Information Retrieval: Algorithms and Heuristics”

Reference Books :

1. Mark leven, “Introduction to search engines and web navigation”, John Wiley and sons Inc., ISBN 9780-170-52684-2.
2. V. S. Subrahamanian, Satish K. Tripathi “Multimedia information System”, Kulwer Academic Publisher
3. Chabane Djeraba, ”Multimedia mining A highway to intelligent multimedia documents”, Kulwer Academic Publisher, ISBN 1-4020-7247-3

NIT-062 Modelling and Simulation		3 1 0
Unit	Topic	Proposed Lectures
I	System definition and components, stochastic activities, continuous and discrete systems, System modeling, Types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.	8
II	System simulation, Need of simulation, Basic nature of simulation, techniques of simulation, comparison of simulation and analytical methods, types of system Simulation, real time simulation, hybrid simulation, simulation of pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag model, Cobweb model.	8
III	Simulation of continuous Systems, analog vs digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an auto-pilot. Discrete system simulation, fixed time-step vs event-to-event model, generation of random numbers, test of randomness, Monte-Carlo computation vs stochastic simulation.	8
IV	System dynamics ,exponential growth models, exponential decay models, logistic curves, system dynamics diagrams, world model.	8
V	Simulation of PERT networks, critical path computation, uncertaintities in activityduration, resource allocation and consideration, Simulation languages, object oriented simulation.	8

Textbooks:

1) Geoftrey Gordon, “System Simulation”, PHI
2) Narsingh Deo, “System Simulation with digital computer”, PHI. 3) Averill M. Law, W. David Kelton, “Simulation Modelling and Analysis”,TMH.

NIT-063 Bioinformatics		3 1 0
Unit	Topic	Proposed Lectures
I	Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary & reference systems, finding new type of data online. Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.	8
II	Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, Transcription-Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.	8
III	Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.	8
IV	Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.	8
V	Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.	8

Textbooks :

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

	NIT-064 Knowledge based decision Support System	3 1 0
Unit	Topic	Proposed Lectures
I	DECISION MAKING AND COMPUTERIZED SUPPORT : Management Support Systems: An Overview - Decision Making, Systems, Modeling , and Support.	8
II	DECISION SUPPORT SYSTEMS: Decision Support Systems: An Overview - Modeling and Analysis - Business Intelligence: Data Warehousing, Data Acquisition, Data Mining, Business Analysis, and Visualization - Decision Support System Development.	8
III	COLLABORATION, COMMUNICATION, ENTERPRISE DECISION SUPPORT SYSTEMS, AND KNOWLEDGE MANAGEMENT: Collaborative Computing Technologies: Group Support Systems - Enterprise Information Systems - knowledge Management.	8
IV	INTELLIGENT DECISION SUPPORT SYSTEMS: Artificial Intelligence and Expert Systems: Knowledge-Based System - Knowledge Acquisition, Representation, and Reasoning - Advanced Intelligent Systems - Intelligent Systems over the Internet.	8
V	IMPLEMENTING IN THE E-BUSINESS ERA : Electronic Commerce - Integration, Impacts, and the Future of the Management Support Systems.	8

Text Book:

1. Efraim Turban, Jay Aronson E., Ting-Peng Liang, "Decision Support Systems and Intelligent Systems", 7th Edition, Pearson Education, 2006.

References:

1. George M .Marakas , "Decision Support Systems in the 21st century",2nd Edition, PHI, 2009. 2. Janakiraman V.S., Sarukesi K., " Decision Support Systems", PHI, 2009.

	NIT-065 Geographic Information System	3 1 0
Unit	Topic	Proposed Lectures
I	FUNDAMENTALS OF GIS,What is GIS – Introduction Defining GIS – Components of a GIS – Spatial data – Introduction - Maps and their influence on the character of spatial data – Other sources of spatial data	8
II	SPATIAL DATA MODELING :Introduction – Entity definition – Spatial data models – Spatial data structures – Modeling surfaces – Modeling networks – Building computer networks – Modeling the third dimension – modeling the fourth dimension - Attribute data management - Introduction – Why choose a databaseapproach? - Database data models – Creating a database – GIS database applications – Developments in databases	8
III	DATA INPUT AND EDITING :Introduction – Methods of data input – Data editing – Towards an integrated database - Data analysis: Introduction – Measurements in GIS – lengths, perimeters and areas – Queries – Reclassification – Buffering and neighborhood functions – Integrating data –map overlay – Spatial interpolation – Network analysis.	8
IV	ANALYTICAL MODELING IN GIS : Introduction – process models – Modeling physical and environmental processes – Modeling human Processes –Modeling the decision – making process – Problems with using GIS to model spatial processes - Output: from new maps to enhanced decisions: Introduction – Maps as output – Non-cartographic output – Spatial multimedia – Mechanisms of delivery – GIS and spatial decision support	8
V	ISSUES IN GIS - The development of computer methods for handling spatial data – Introduction – Handling spatial data manually – The development of computer methods for handling spatial data – The development of GIS - Data quality issues – Introduction –Describing data quality and errors sources of errors in GIS	8

Text Books:

1. Ian Heywood, Sarah Cornelius and Steve carver, “Introduction to geographical information systems”, Pearson Education, 4th Edition, 2012.

Refrences:

1. DeMers, M.N., “Fundamentals of Geographic Information Systems”, 3 rdEdition, Wiley Press, 2009.
2. Lo C.P. and Yeung, A.K.W.,“Concepts and Techniques of Geographic Information Systems”, Prentice Hall, 2002.
3. Burrough, P.A. and R.A. McDonald, “Principles of Geographical Information Systems”, Oxford University Press, 1998.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

TEXTBOOKS:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NIT 066 E-Business Strategies		2 1 0
Unit	Topic	Proposed Lectures
I	**Electronic Commerce Environment and Opportunities:** Background – The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to Open EDI – Electronic Commerce with WWW/Internet – Commerce Net Advocacy – Web Commerce going forward.	8
II	**Approaches to Safe Electronic Commerce:** Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET)- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash.	8
III	**Internet/Intranet Security Issues and Solutions:** The need for Computer Security – Specific Intruder Approaches – Security strategies – Security tools – Encryption – Enterprise Networking and Access to the Internet – Antivirus programs – Security Teams.	8
IV	**MasterCard/Visa Secure Electronic Transaction:** Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of Email - MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.	8
V	**Internet and Website Establishment:** Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet- Case study.	8

TEXT BOOK 1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2005.

REFERENCES 1. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004. 2. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money”, Atlantic Publishing Company, 2006.

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

References

1. Silberschatz,korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NIT 067- BIG DATA		2 1 0
Unit	Topic	Proposed Lectures
I	UNDERSTANDING BIG DATA What is big data,why big data,convergence of key trends, unstructured data, industry examples of big data, web analytics,big data and marketing,fraud and big data,risk and big data ,credit risk management, big data and algorithmic trading,big data and healthcare,big data in medicine,advertising and big data,big data technologies, introduction to Hadoop,open source technologies,cloud and big data mobile business intelligence,Crowd sourcing analytics ,inter and trans firewall analytics	8
II	NOSQL DATA MANAGEMENT Introduction to NoSQL , aggregate data models ,aggregates ,key-value and document data models, relationships, graph databases, schema less databases ,materialized views,distribution models ,sharding , master-slave replication , peer-peer replication , sharding and replication , consistency , relaxing consistency , version stamps , map-reduce , partitioning and combining , composing map-reduce calculations	8
III	BASICS OF HADOOP Data format , analyzing data with Hadoop , scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , compression , serialization , Avro file-based data structures	8
IV	MAP REDUCE APPLICATIONS Map Reduce workflows , unit tests with MRUnit , test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats .	8
V	HADOOP RELATED TOOLS Hbase,data model and implementations, Hbase clients ,Hbase examples – praxis.Cassandra ,cassandra data model , cassandra examples , cassandra clients , Hadoop integration. Pig , Grunt , pig data model , Pig Latin , developing and testing Pig Latin scripts. Hive , data types and file formats , HiveQL data definition , HiveQL data manipulation – HiveQL queries	8

Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Big-Data Black Book, DT Editorial Services, Wily India
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. 5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012. 7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Dr.A.P.J.Abdul
kalam Technical University,UttarPardesh,Lucknow
(Formerly Uttar Pradesh Technical University)
STUDY EVALUATION SCHEME
INFORMATION TECHNOLOGY
YEAR forth, SEMESTER –VII
(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NIT-751	Cryptography & Network Security*	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdulkalam Technical University,UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
INFORMATION TECHNOLOGY
YEAR forth, SEMESTER –VIII
(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NIT-801	Mobile Computing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practicals / Training /Projects									
5	NIT-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

***** *At least 10 problems are to be considered based on corresponding theory course.*

Open Elective I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Bio Technology
NOE-075 Mobile Application Development
NOE-076 Ethical Hacking and Prevention
NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NIT-071 IT in Forensic Science

Departmental Elective IV

1. NCS-074 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NCS-701 Distributed System
5. NCS-073 Computer Vision

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-082 Real Time System
3. NCS-084 Grid Computing
4. NCS-801 Digital Image Processing
5. NIT-080 Natural Language Processing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-087 Embedded Systems
3. NCS-088 Semantic Web and Web Services
4. NIT-081 Software Quality Engineering
5. NIT-082 Software Reliability

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 **L T P**
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5
Government policy for small scale industry; stages in starting a small scale industry. 2
UNIT -II
Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8
UNIT -III
Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9
UNIT -IV
Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9
U NIT -V
Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5
Role of various national and state agencies which render assistance to small scale industries. 2
Text / Reference Books:
1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. 5
UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. 2
UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5
UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. 8
UNIT –V
ISO-9000 and its concept of Quality Management
7
ISO 9000 series, Taguchi method, JIT in some details.
Text / Reference Books:
1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.
UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.
UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.
UNIT-IV
Theory of Games :
Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poisson queuing model, single server models.
UNIT-V Inventory
Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:
1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 **L T P**

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P
3 1 0

UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:
1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077

L	T	P
3	1	0

UNIT-I:

Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:

Project Organization and Scheduling 10

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:

Project Monitoring and Control10

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:

Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:

Project Management and Project Management Tools10

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.
Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,
Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)
Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Authentication Applications:
Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.
Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

Text Books:

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
5. Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
6. AtulKahate, “Cryptography and Network Security”, Tata McGraw Hill

ARTIFICIAL INTELLIGENCE

NCS-702 **L T P**
3 1 0

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering:**10**

Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

Verification:

Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II

Functional Testing::**10**

Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing:

Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

Unit-III

Regression Testing::**10**

What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

Reducing the number of test cases:

Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV:**10**

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing

Automated Test Data Generation:

Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V:**5**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

Text Books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K.K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, "Software System Testing and Quality Assurance", Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

IT IN FORENSIC SCIENCE

NIT-071 **L T P**
3 1 0

UNIT I 8

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security. Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans. Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II 8

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III 8

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques. Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV 12

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system. Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V 8

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

TOTAL LECTURE: 44

Text Books:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media 5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture ,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiand WiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet SwitchingNetworks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV 8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.

Text Books:

1. William Stallings, "High speed networks and internet", Second Edition, Pearson Education, 2002
2. Warland, Pravin Varaiya, "High performance communication networks", Second Edition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

Text Books:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076

L	T	P
3	1	0

UNIT I **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

Text Books:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, andDesign",Pearson Education, 2005.
2. Newcomer, Lomow"Understanding SOA with Web Services", Pearson Education, 2005.
3. SandeepChatterjee, James Webber, "Developing Enterprise Web Services, AnArchitect's Guide", Pearson Education, 2005.
4. Dan Woods and Thomas Mattern," Enterprise SOA Designing IT for BusinessInnovation" O'REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

DISTRIBUTED SYSTEMS

NCS-701 **L T P**

3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks,Lamport's& vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

Text Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

CRYPTOGRAPHY AND NETWORK SECURITY LAB

NIT-751	**L**	**T**	**P**
	0	**0**	**2**

The following programs should be implemented preferably on 'UNIX' platform using 'C' language (for 1-5) and other standard utilities available with 'UNIX' systems (for 6-8) :-

1. Implement the encryption and decryption of 8-bit data using 'Simplified DES Algorithm'
2. (created by Prof. Edward Schaefer) in 'C'.
3. Implement 'Linear Congruential Algorithm' to generate 5 pseudo-random numbers in'C'.
4. Implement Rabin-Miller Primality Testing Algorithm in 'C'.
5. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.
6. Implement RSA algorithm for encryption and decryption in 'C'
7. Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.
8. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.
9. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:

(a) Two neighborhood IP addresses on your LAN
(b) All ICMP requests

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 L T P
3 1 0

UNIT-I
Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4
UNIT-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9
UNIT-III Geothermal
Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations. 2
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations. 3
UNIT-IV
Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations. 2
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6
UNIT-V
Bio-mass:
Availability of bio-mass and its conversion theory. 2
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants. 3
Text/References Books:
1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International. 5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI
Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 L T P
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. 8
UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7
UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. 8
UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8
UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9
Reference Books:
1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 L T P
3 1 0

UNIT-1
Concept of Product, definition and scope.
Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.
UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
UNIT –III
Transformations, Brainstorming& Synetics, Morephological techniques.
Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.
Economic aspects, Fixed and variable costs, Break-even analysis.
UNIT-IV
Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.
UNIT-V
Existing techniques, such as work-study, SQC etc. for improving method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.
Text/Reference Books:
3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 L T P
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.
Text/Reference Books:
1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automat (c)All TCP SYN Packets

MOBILE COMPUTING

NIT-801 **L T P**
3 1 0

Unit – I **8**
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit – II **12**
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III **8**
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit – IV **8**
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V **8**
Ad-hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

TOTAL: 44 PERIODS

Text Books:

1. Thampi - Mobile Communications and Computing ,Wiley
2. J. Schiller, Mobile Communications, Addison Wesley.
3. Charles Perkins, Mobile IP, Addison Wesley.
4. Charles Perkins, Ad hoc Networks, Addison Wesley.
5. Upadhyaya, "Mobile Computing", Springer
6. Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India.

PATTERN RECOGNITION

NCS-080	L	T	P
	3	1	0

Unit-I

Introduction: 8
Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: 8
Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods:12
Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques:8
Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: 8
Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

Text Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.
4. Pattern Recognition,Narasimha Murty,Universities Press.
5. Pattern Recognition and Image Analysis,Gose, Johnsonbaugh & Jost,PHI Learning.
6. PATTERN RECOGNITION: TECHNIQUES AND APPLICATIONS,SHINGHAL,OXFORD UNIVERSITY PRESS.

REAL TIME SYSTEM

NCS-082 **L T P**
3 1 0

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

Text Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.
5. KRISHNA, Real-Time Systems, Mc Graw Hills

GRID COMPUTING

NCS-084	L	T	P
	3	1	0

UNIT I

CONCEPTS AND ARCHITECTURE **10**

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II

GRID MONITORING **10**

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III

GRID SECURITY AND RESOURCE MANAGEMENT **10**

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV

DATA MANAGEMENT AND GRID PORTALS **10**

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V

GRID MIDDLEWARE **5**

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

Text Books:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.
5. Joshy Joseph, Craig Fellenstein, Grid Computing, Pearson Education.
6. Grid Computing Security, Anirban Chakrabarti, Springer, 2007.

Digital Image Processing

NCS-801

L	T	P
3	1	0

UNIT-I

Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

Text Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

Natural Language Processing

NIT-080	**L**	**T**	**P**
	3	**1**	**0**

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

DATA COMPRESSION

NCS-085

L	T	P
3	1	0

Unit - I: **10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: **10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: **10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

Text Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,Khalid Sayood, The Morgan aufmann Series
4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. T ext Compression1st Edition by Timothy C. Bell Prentice Hall.

EMBEDDED SYSTEMS

NCS-087	**L**	**T**	**P**
	3	1	0

Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. H.Kopetz, "Real-Time Systems", Kluwer
3. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
4. Shibu K.V., "Introduction to Embedded Systems", TMH
5. Marwedel, "Embedded System Design", Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088 **L T P**

3 1 0

UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

SOFTWARE QUALITY ENGINEERING

NIT-081	L	T	P
	3	1	0

UNIT-I:

Introduction **8**

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II:

Software Quality Metrics **8**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III:

Software Quality Management and Models **8**

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV:

Software Quality Assurance **12**

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V:

Software Verification, Validation & Testing: **8**

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

TOTAL: 44 PERIODS

Text Books

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley
3. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
4. Royce, Software Project Management, Pearson Education
5. Kieron Conway, Software Project Management, Dreamtech Press
6. S. A. Kelkar, Software Project Management, PHI Publication.

SOFTWARE RELIABILITY

NIT-082 **L T P**
3 1 0

UNIT-I:
Introduction **8**

Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II:
Software Reliability Metrics **8**

Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III:
Software Reliability Assessment Models **8**

Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV:
Software Reliability Allocation Models **8**

Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V:
Software Reliability Techniques **12**

Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

TOTAL: 44 PERIODS

Text Books

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

B. Tech. (2nd Year)

1. **Mechanical Engineering**
2. **Production Engineering**
3. **Industrial & Production Engineering**
4. **Mechanical & Industrial Engineering**
5. **Manufacturing Technology**
6. **Automobile Engineering**
7. **Aeronautical Engineering**

[Effective Form session 2014-15]

STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / *Aeronautical Engineering*
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NME-301	Material Science	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NME-303	Thermodynamics	2	1	0	15	10	25	50	75	3
7	AUC-001/ AUC-002	*Human Value & Professional Ethics/Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
8	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
9	NME-351	Material Science & Testing Lab.	0	0	2	10	10	20	30	50	1
10	NME-352	Machine Drawing I	0	0	3	10	10	20	30	50	1
11	NME-353	Thermodynamics Lab.	0	0	2	10	10	20	30	50	1
12	NGP-301	GP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: *Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).*

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / *Aeronautical Engineering*
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEE-409	Electrical Machines & Controls	3	1	0	30	20	50	100	150	4
3	NME-401	Applied Thermodynamics	3	1	0	30	20	50	100	150	4
4	NME-402	Manufacturing Science & Technology I	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NME-403	Measurement and Metrology	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security/Human Value & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
8	NEE-459	Electrical Machines & Controls Lab.	0	0	3	10	10	20	30	50	1
9	NME-451	Machine Drawing II	0	0	3	10	10	20	30	50	1
10	NME-452	Manufacturing Technology I Lab.	0	0	2	10	10	20	30	50	1
11	NME-453	Measurement and Metrology Lab.	0	0	2	10	10	20	30	50	1
12	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NCE- 301: FLUID MECHANICS **L T P**
3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,
2. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
3. White,F.M. "Fluid Mechanics" TMH, New Delhi.
4. Munsen et al ,"Fundamental of Fluid Mechanics" Wiley Newyork Ltd
5. Garde, R.J., " Fluid Mechanics", SciTech Publications Pvt. Ltd
6. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education

NME- 301: MATERIAL SCIENCE **L T P**
3 1 0

Unit-I

Introduction : Importance of materials. historical perspective, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bondings.

4

Crystallography and Imperfections : Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. Xray crystallography techniques. Imperfections, Defects & Dislocations in solids.

3

Unit-II

Mechanical properties and Testing : Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testing of material such as Strength tests, Hardness tests, Impact tests, Fatigue tests, Creep tests, and Non-destructive testing (NDT).

4

Microstructural Exam : Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass.

2

Phase Diagram and Equilibrium Diagram : Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram.

3

Unit-III

Ferrous materials : Various types of carbon steels, alloy steels and cast irons, its properties and uses.

2

Heat Treatment : Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering (Austempering, Martempering), and various case hardening processes. Time Temperature Transformation (TTT) diagrams.

2

Diffusion: Diffusion of Solids, Ficks I and II law.

1

Non-Ferrous metals and alloys : Non-ferrrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type of Brass and Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys.

3

Unit-IV

Dielectric Materials: Dielectric Materials and their applications.

1

Magnetic properties : Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages.

2

Electric properties, Semi conductors and Super conductors: Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Super conductivity and its applications. Messier effect. Type I & II superconductors. High Tc superconductors.

5

Unit-V

Ceramics : Structure types and properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics.

2

Plastics : Various types of polymers/plastics and its applications. Mechanical behaviour and processing of plastics. Future of plastics.

2

Other materials : Brief description of other material such as optical and thermal materials, Composite Materials and its uses. Introduction to Smart materials & Nano-materials and their potential applications

3

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control.

2

Books and References:

1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.
2. Elements of Material Science & Engineering by Van Vlack, Pearson
3. Materials Science and Engineering - A First Course by Raghavan, PHI
4. Material Science and Engineering by Smith, Hashemi and Prakash, TMH
5. Introduction to Materials Science for Engineers by Shackelford, Pearson
6. Material Science by Narula , TMH.
7. Material Science for Engineering Students by Fischer, Academic Press
8. Technology of Engineering materials by Philip and Bolton, Butterworth-Heinamann

NME-302: MECHANICS OF SOLIDS **L T P**

3 1 0

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended

columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by.Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and & Yơungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI
7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NME-303 : THERMODYNAMICS **L T P**
2 1 0

Unit – I:

Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases.

3

Zeroth law of thermodynamics: Concept of Temperature and its' measurement, Temperature scales.

1

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, , Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I.

3

Unit – II:

First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

2

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

4

Unit – III

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

4

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

3

Unit – IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Mollier chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

5

Introduction to IC engines: Compression Ignition engines, Spark Ignition engines, 2 stroke and 4 stroke engines, Performance parameters of IC engine, Heat balance sheet.

2

Books and References:

1. Engineering Thermodynamics by P.K.Nag, TMH
2. Thermodynamics by Shavit and Gutfinger, CRC Press.
3. Thermodynamics- An Engineering Approach by Cengel & Boles, TMH.
4. Basic Engineering Thermodynamics, Joel, Pearson.
5. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
6. Engineering Thermodynamics by Dhar, Elsevier.
7. Engineering Thermodynamics by Onkar Singh, New Age International.
8. Thermodynamics by Prasanna Kumar Pearson
9. Engineering Thermodynamics by C.P. Arora.
10. Engineering Thermodynamics by Rogers and Mayhew, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Fundamentals of Thermodynamics - Sonntag, Borgnakke and Van Wylen , John Wiley
13. Engineering Thermodynamics by Jones and Dugans, PHI

14. Modern Engineering Thermodynamics by Balmer, Academic Press.
15. An Introduction to Thermodynamics, By Rao, University Press.

NME- 351: FLUID MECHANICS LAB. **L T P**
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NME- 351: MATERIALS SCIENCE AND TESTING LAB. **L T P**
0 0 2

In this lab Experiments on Material Science and Experiments on Material Testing are to be conducted as given below:

(A). Experiments on Material Science (at least 5 of the following):
1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & micro examination of the welded specimen.
10. Study of Magnetic/ Electrical/Electronic materials.

(B). Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

NME-352: MACHINE DRAWING -I LAB

L	**T**	**P**
0	**0**	**3**

Introduction (1 drawing sheets)

Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

2

Orthographic Projections (3 drawing sheets)

Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

3

Fasteners (2 drawing sheets)

Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

2

Riveted joints (1 drawing sheet)

Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

1

Assembly drawing (2 drawing sheets)

Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

2

Free hand sketching (1 drawing sheet**)**

Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

1

Computer aided drafting (1 drawing**)**

Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts

1

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

NME-353 : THERMODYNAMICS LAB **L T P**
0 0 2

Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance sheet for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment(s) on thermodynamics

NEE 409 ELECTRICAL MACHINES & CONTROL **L T P**
0 0 2

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.

Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt- Amp relations, Efficiency, Advantages & Disadvantages, Applications.

D.C. Motors: Concept of starting, Speed control, Losses and Efficiency *(simple numericals only)*

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque- slip characteristics, Speed control *(simple numericals only).*

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. *(simple numericals only)*

Synchronous Motor *(conceptual treatment only)*: Starting, Effect of excitation on line current (V-curves), Synchronous condenser.

Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force- current analogy, Electrical analog of simple mechanical systems; Concept of transfer function & its determination for simple systems.

Control System: Open loop & closed loop controls systems; advantages and disadvantages.

Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, Limitations (*simple numerical only*); *Only conceptual treatment of* Polar plot, Nyquist stability criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and Phase margin and their determination.

Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Books and References:

1. I. J. Nagrath & D. P. Kothari, “Electrical machines”, Tata McGraw Hill.
2. P.S.Bimbhra, “Electrical Machinery”, Khanna Publishers
3. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
4. Ghosh, “Control Systems: Theory and Applications”, Pearson
5. B.C. Kuo, “Automatic Control systems”, Wiley India Ltd.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, “Control Systems: Principles and Design” Tata McGraw Hill.

EME-401: APPLIED THERMODYNAMICS **L T P**
3 1 0

Unit-I

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

3

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

4

Unit-II

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

6

Condenser: Classification of condenser, air leakage, condenser performance parameters.

2

Unit-III

Vapour Power cycles: Carnot vapour power cycle, Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

4

Steam Engines: Modified Rankine cycles, working and classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance.

3

Unit-IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow.

3

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

4

Unit-V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

4

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

3

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, TMH
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI

5. Theory of Stream Turbine by W.J. Kearton
6. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man
7. Gas Turbine, by V. Ganeshan, Tata Mc Graw Hill Publishers.
8. Steam & Gas Turbine by R.Yadav, CPH Allahabad
9. Thermodynamics and Energy Systems Analysis, Borel and Favrat, CRC Press
10. Mechanics and Thermodynamics of Propulsion, Hill and Peterson, Pearson
11. Thermal Engineering by Kulshrestha, Vikas Publishing.
12. Thermal Engg. By P.L. Ballaney, Khanna Publisher
13. Thermal Engg. By R.K. Rajput, Laxmi Publication

NME- 402 : MANUFACTURING SCIENCE & TECHNOLOGY-I **L T P**
3 1 0

Unit-I

Introduction :
Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items.
2

Metal Forming Processes :
Elastic & plastic deformation, yield criteria(Mises' and Tresca's). Hot working versus cold working.
2

Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.
5

Unit-II

Metal Forming Processes (continued):
Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application.
3

Condition for Rolling force and power in rolling. Rolling mills & rolled-sections.
2

Design, lubrication and defects in metal forming processes.
2

Unit-III

Sheet Metal working :
Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load(capacity) needed.
4

Analysis of forming process like cup/deep drawing. Bending & spring-back.
3

Unit-IV

Casting (Foundry)
Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting,. Sand casting, defects & remedies and inspection. Cupola furnace.
7

Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO_2 casting and Stir casting etc.
3

Unit-V

Unconventional Metal forming processes :
Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming.

2

Powder Metallurgy :
Introduction to Powder metallurgy manufacturing process. Application and, advantages.

1

Jigs & Fixtures :
Locating & Clamping devices & principles. Jigs and Fixtures and its applications.

2

Manufacturing of Plastic components :
Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

2

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by P.C. Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., TMH
5. Manufacturing Processes by Shan, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson
7. Materials and Manufacturing by Paul Degarmo.
8. Manufacturing Processes by Kaushish , PHI
9. Principles of Foundry Technology, Jain, TMH
10. Production Technology by R.K. Jain

EME -403 : MEASUREMENT AND METROLOGY **L T P**
3 1 0

Unit-I

MECHANICAL MEASUREMENTS
Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static performance characteristics and elementary idea of dynamic performance characteristics of measurement devices, calibration, concept of error (systematic and random), sources of error, statistical analysis of errors.

4

Sensors and Transducers:
Types of sensors, types of transducers and their characteristics.

2

Signal Transmission and Processing:
Signal transmission and processing devices and systems. Signal display & recording devices

2

Unit-II

Time Related Measurements:
Stroboscope, frequency measurement by direct comparison. Measurement of displacement

2

Measurement of Pressure:
Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

1

Strain Measurement:
Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

2

Temperature Measurement:
Thermometers, bimetallic thermocouples, thermistors and pyrometers.

2

Measurements of Force, Torque, Acceleration, and Vibration:
Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments, accelerometers vibration pick ups and decibel meters, vibrometers.

3

Unit-III:

Measurement of Fluid Velocity and Flow rate:
Measurement of fluid velocity, Hot Wire Anemometry, Laser Doppler Velocimetry. Flow measuring devices, Rotameter.

2

METROLOGY
Metrology and Inspection :
Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standardisation.

2

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator.

2

Limit gauges classification, Taylor's Principle of Gauge Design.

1

Unit-IV
Measurement of geometric forms like straightness, flatness, roundness.

2

Tool makers microscope, profile project autocollimator.

1

Interferometry: principle and use of interferometry, optical flat.

2

Measurement of screw threads and gears.

1

Surface texture: quantitative evaluation of surface roughness and its measurement.

1

Books and References:

1. Experimental Methods for Engineers by Holman, TMH
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, TMH
5. Measurement Systems, Application Design by Doeblein, TMH
6. Hume K.J., "Engineering Metrology", MacDonald and Co
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

NME-451: MACHINE DRAWING -II LAB **L T P**
0 0 3

Review of Orthographic Projections (2 drawing sheets)
Orthographic projection of solids in first angle of projection, missing lines views, interpretation of views

2

Part and Assembly Drawing (4 drawing sheets)
Introduction to assembly drawing, steps in making of assembly drawing, assembly drawing of footstep bearing, lathe tool post, lathe tool post, tail stock stuffing box, connecting rod, gate valve, screw jack, Ramsbottom's safety valve etc.

4

Production drawing: (2 drawing sheet)
Limits, fits and tolerances, types of tolerances and fits, hole basis and shaft basis of fits, and geometric dimensioning and tolerance, surface texture, indication of surface roughness, methods of placing machining symbols on orthographic views

2

Computer Based Solid Modeling (4 computer based drawing assignments)
Introduction, input, output devices, introduction to any 3D modeling software like AutoCAD, Solidworks, Creo Parametric, Autodesk Inventor etc., basic commands and development of 3D drawings of simple machine parts and assemblies.

4

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
3. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy-New Age
5. Autodesk Inventor by Examples, Sam Tikoo, Wiley

NME-452 : MANUFACTURING TECHNOLOGY-1 LAB **L T P**
0 0 3

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

NME 453: MEASUREMENT & METROLOGY LAB **L T P**
0 0 2

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. Experiment on measurement of pressure.
11. Study of temperature measuring equipments.
12. Measurement using Strain gauge.
13. Measurement of speed using stroboscope.
14. Experiment on measurement of flow.
15. Measurement of vibration/power.
16. Experiment on dynamometers.
17. To study the displacement using LVDT.

NEE – 459 : ELECTRICAL MACHINES & CONTROL LAB **L T P**
0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System [Out of total 10, at least 04 experiments should be Simulation based]

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an AC 2-phase servo motor.
4. To study dc servo position control system within P and PI configurations.
6. To study Synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

3rd Year

[Effective from session 2015-16]

1. B. Tech. Mechanical Engineering
2. B. Tech. Production Engineering
3. B. Tech. Industrial & Production Engineering
4. B. Tech. Mechanical & Industrial Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NME-505	I.C. Engines & Compressors	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NME-604	Refrigeration & Air-conditioning	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-014	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NME-654	Refrigeration & Air Conditioning Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NPI-501	Production Planning & Control	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NPI-601	Principles of Machine Tool Design	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-015	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NPI-651	Machine Tool Design Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency						50		50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

NME-501 : MACHINE DESIGN-I **L T P**
2 1 0

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

3

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

4

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

4

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

4

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

4

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

4

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

4

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

3

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion

6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-502 : KINEMATICS OF MACHINES **L:T:P**
3: 1: 0

Unit I

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

4

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, rubbing velocity at a pin joint, instantaneous center method, types and locations of instantaneous center, Kennedy's theorem, velocities in four bar mechanism and slider crank mechanism.

4

Unit II

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism, Klein's construction for slider crank mechanism and four bar mechanism, analytical method for slider crank mechanism.

4

Kinematic synthesis of mechanism:

Introduction, dimensional synthesis of mechanisms, motion, path and function generation, Chebyshev spacing, three position synthesis, graphical approach for four link mechanisms, straight line mechanisms, special mechanisms – indicator diagram mechanisms, steering mechanisms, Hook's Joint

4

Unit III

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration, simple harmonic and cycloidal motions of follower. Analytical methods for cam profile.

8

Unit IV

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, interference and undercutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

8

Unit V

Friction drives

Introduction, belt and rope drives, open and crossed belt drives, velocity ratio, slip, power transmission, effect of mass of belt on power transmission, maximum power transmission, initial tension and maximum tension, pivots and collars, uniform pressure and uniform wear, clutches.

8

Books:

1. Theory of Mechanisms and Machines: A Ghose and A K Malik, East West Press Pvt Ltd.
2. Theory of Mechanisms and Machines: J JUicker, G R Pennock and J E Shigley, Oxford University Press.
3. Kinematics and dynamics of machinery: C E Wilson and J E Sadler: PEARSON
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Machines: S S Rattan, McGraw Hill
6. Theory of Machines: Thomas Bevan, Pearson

NME-503: MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 1 0

Unit I

Metal Cutting-

Mechanics of metal cutting.Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants.Tool materials. Tool wear and tool life. Machinability.Dynamometer, Brief introduction to machine tool vibration and surface finish.Economics of metal cutting.

9

Unit-II

Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III

Grinding &Super finishing

(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:

Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV

B. Metal Joining (Welding)

Survey of welding and allied processes.Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters.Resistance welding - spot, seam projection etc.Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds and

remedies. Weld decay in HAZ.

10

Unit-V

C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.
4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

NME-504 : HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1

Introduction to Heat Transfer:

Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :

General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :

Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

5

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

NME-505 : I C ENGINES & COMPRESSORS **L T P**

3 1 0

Unit-1

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.

Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles

Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III

CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings

Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

NPI-501: PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.

7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

NME-551 : MACHINE DESIGN-I Lab **L T P**

0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

NME-553 : MANUFACTURING TECHNOLOGY -II – LAB **L T P**

0 0 3

Minimum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints.

NME-554 : HEAT & MASS TRANSFER – LAB **L T P**

0 0 3

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment
14. Heat exchanger - Counter flow experiment

NME-602: MACHINE DESIGN-II **L T P**

3 1 0

UNIT I

Principle of transmission and conjugate action

Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears

Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

6

UNIT II

Bevel gears

Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-603 : DYNAMICS OF MACHINES **L T P**
3 1 0

Unit I

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

7

Unit II

Gyroscope:

Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopicstabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

4

Mech. Vibrations:

Types of Vibration, Degrees of freedom. Longitudinal Vibration: Single degree free and damped vibration. Forced vibration of single degree under harmonic excitation.Vibration isolation.Whirling of shaft and critical speed.

5

Unit III

Balancing:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,balancing of single cylinder engine, balancing of multi cylinder inline engines.

8

Unit IV

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor, Controlling force diagrams for Porter governor and spring controlled governors.

8

Unit V

Brakes and dynamometers:

Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

8

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

NME-604 : REFRIGERATION & AIR CONDITIONING **L T P**
3 1 0

Unit-1

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5

Refrigeration Equipment & Application:

Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

NPI- 601 : PRINCIPLES OF MACHINE TOOL DESIGN **L T P**
3 1 0

Unit-I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc.General requirement of machine tool design.Machine tool design process. Tool wear, force Analysis.

9

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, election of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

8

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

7

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

3

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports.

3

Layout of bearings, selection of bearings machine tools

2

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools.

5

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls.Basics of numerical controls.Machine tool testing.

3

Books :
1. Machine Tools Design & Numerical Controls by N.K. Mehta, McGraw-Hill
2. Design of Machine Tools by S.K. Basu Allied Publishers.
3. Principles of Machine Tools by Bhattacharya and Sen. New Central Book Agency.
4. Machine Tool Design Handbook by CMTI, McGraw-Hill.

NME-011 : ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduction:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Intgerlinear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern searchmethods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's andVariable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem fromarithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization,Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

NME-012: FINITE ELEMENT METHODS **L T P**
3 1 0

Unit 1
Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.
Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II
Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III
Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV
Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials.
Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V
Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.
Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning
3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

NME-013 : MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I

Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III

Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

NME-014: MECHATRONICS **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semi conductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semi conductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, “Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, “Introduction to Mechatronics & Measurement Systems, 4e”, McGraw-Hill Education, 2014.
3. M Jouaneh, “Fundamentals of Mechatronics”, Cengage Learning, 2013.
4. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
6. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, “Mechatronics”, McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. “Mechatronics: Integrated Mechanical Electronic Systems”, Wiley

NME-021 : FLUID MACHINERY **L T P**
2 1 0

UNIT-I

Introduction: Impulse of Jet and Impulse Turbines:

Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler’s fundamental equation.Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & *c*urve),Classification of turbines, Impulse turbines, Constructional details, Velocity triangles,Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power andefficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principlesof similarity, Unit and specific speed, Performance characteristics, Selection of waterturbines.

8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficienciesof centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV

Positive Displacement and other Pumps:

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.
Hydraulic ram, Jet pumps, Air lift pumps.

8

BOOKS:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.

10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

NME -022: PRODUCT DESIGN & DEVELOPMENT **L T P**
2 1 0

UNIT I:
Introduction to Product Design, Applications, Relevance, Product Definition, Scope, Design definitions, The role and nature of design, Old and new design methods, Design by evolution vs design by innovation. Examples such evolution of bicycle, safety razor etc. Need based development, Technology based developments. Physical realisability& Economic feasibility of design concepts.

8

UNIT II:
Morphology of Design, Divergent, Transformation and Convergent phases of product design, Identification of need, Analysis of need, Design criteria, Functional aspects, Aesthetics, ergonomics, form (structure). Shape, size, color, Creativity, Mental blocks in creativity, Removal of blocks, Ideation Techniques.

8

UNIT III:
Transformations stage of design, Brainstorming &Synectics, Morphological techniques, Utility concept, Utility value, Utility index, Economic aspects of design, Fixed and variable costs, Break-even analysis, Product Appraisal Information and literature search, patents, standards and codes, Environment and other safety considerations in product design.

8

UNIT IV:
Reliability, Reliability considerations in product design, Bath tub curve, Reliability of systems in series and parallel. Failure rates, MTTF and MTBF, Optimum spares from reliability consideration, Design of displays and controls, Man-Machine interface, Compatibility of displays and controls, Ergonomic aspects of design, Anthropometric data and its importance in design

8

Books and references:

1. Product Design & Manufacturing - A.K.Chitale&R.C.Gupta, Prentice Hall.
2. Engg . Product Design -C .D. Cain, Bussiness Books.
3. Product Design by Otto and Wood- Pearson
4. Industrial design for Engineers –W .H. Mayall, Itiffe.
5. Product Design & Decision Theory - M.K. Starr - Prentice Hall
6. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall.
7. Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
8. Human Factor Engg. – Mccormick E.J., McGraw-Hill.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H .Flurscheim, The Design Council - London.

NME-023: RELIABILITY ENGINEERING **L T P**
2 1 0

UNIT-I

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

6

UNIT-II

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

8

UNIT-III

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

10

UNIT-IV

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

4

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

4

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

NME-024 : UNCONVENTIONAL MANUFACTURING PROCESSES **L T P**
2 1 0

UNIT-I

Introduction, Limitations of conventional manufacturing processes, Need for unconventional manufacturing processes, its classification and future possibilities, Hybrid processes

4

Unconventional Machining Process based on material removal by abrasion, Principle and working and applications Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet machining and Ultrasonic Machining.

4

UNIT-II

Thermoelectric unconventional methods, Principle, working and applications of Plasma Arc Machining, Laser Beam Machining, Electron Beam Machining etc

4

Working principle and applications of Electric Discharge Machining, EDM machines, EDM process characteristics, Wire electric discharge machining

4

UNIT-III

Electro-chemical machining processes, ECM, its working principle, advantages and applications, Electro-chemical grinding, Electro-chemical deburring, Chemical machining.
Unconventional welding processes: Explosive welding, Cladding etc., Under water welding, Metalizing, Plasma are welding/cutting etc.

8

UNIT-IV

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-discharge forming, water hammer forming, explosive compaction etc.

5

Electronic-device Manufacturing, Diffusion and Photo- Lithography process for electronic-device manufacturing.

3

Books and references:

1. Modern Machining Processes – P.C. Pandey
2. Advanced Machining Processes, V.K. Jain, Allied Publishers.
3. Handbook of Manufacturing Processes, James G Bralla, Industrial Press.

NME-651 : FLUID MACHINERY Lab **L T P**
0 0 3

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

NME-652 : MACHINE DESIGN-II Lab **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

NME-653 : THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

NME-654 : REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 3

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.

6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

NPI-651 : MACHINE TOOL DESIGN LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Measurement and analysis of cutting forces in orthogonal turning.
2. Flank wear – time characteristics for single point cutting tools.
3. (i) Checking the level of installation of a lathe in horizontal & vertical planes

   (ii) Checking the bed ways for straightness and parallelism.
4. Testing the main spindle of a lathe for axial movement and true running.
5. Process capability determination of a center lathe.
6. Flatness checking of a surface plate.
7. A study of devices for intermittent motion used in machine tools e.g. ratchet gear & Geneva Mechanism.
8. A study of Kinematics structure of lathe/milling machine.
9. A study of the drives for reciprocation used in machine tools.
10. Development the speed chart and gearing diagram for a gassed head lathe.
11. A study of the cone pulley drive in center lathe and development of its raydiagram for the speed structure.
12. Efficiency testing of lathe at various parameters-values.
13. Accuracy analysis of finished cylindrical work-pieces produced on a lathe.
14. Cutting (turning) with inclined placed tool (in tool fixture).
15. Turning with two simultaneously cutting tool (one from front on usual tool postand the other tool from back on tool-fixture on carriage)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20016-17]

YEAR IV, SEMESTER-VII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-071 to 074	Open Elective -I	3	1	0	30	20	50	100	150	4
2	NME-701	CAD	3	1	0	30	20	50	100	150	4
3	NME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
4	NME-031 to NME-034	Departmental Elective – III	3	1	0	30	20	50	100	150	4
5	NME-041 to NME-044	Departmental Elective – IV	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-751	CAD/CAM Lab	0	0	2	10	10	20	30	50	1
6	NME-752	I. C. Engine and Automobile Lab.	0	0	2	10	10	20	30	50	1
7	NME-753	INDUSTRIAL TRG.	0	0	2	-	50	50	-	50	1
8	NME-754	PROJECT	0	0	3	-	50	50	-	50	2
	GP-701	GP	-	-	-	-	-	50	-	50	-
		TOTAL	15	5	9					1000	25

Note- Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through report and viva voce etc.
Project should be initiated in 7th semester beginning **(End Semester Examination to be conducted for evaluation for 7th sem),** and should be complete by the end of 8th semester with good Report and power-point Presentation etc.

Open Electives – I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Biotechnology

Departmental Elective III

NME-031 Computer Aided Manufacturing
NME-032 Project Management
NME-033 Computational Fluid Dynamics
NME-034 Composite materials

Departmental Elective IV

NME-041 Total Quality Management
NME-042 Thermal Turbo Machines
NME-043 Mechanical System Design
NME-044 Automation and Robotics

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NPI-801	Quality Control	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective –V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective -V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing.

NME-701: COMPUTER AIDED DESIGN (CAD) **L T P**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

8

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation .

8

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

8

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/Draftsight (any one)&3d solid modeling software Solidworks/Autodesk Inventor/PTC Creo /Catia (Any one)etc.

8

UNIT-V

Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

8

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India

2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill
4. CAD/CAM: Computer Aided Design and Manufacturing, by Groover, Pearson India
5. Mathematical Elements for Computer Graphics, buy Rogers and Adams, McGraw Hill
6. Finite Element Method By S S Rao
7. FE Analysis Theory and Programming, by Krishnamoorthy, Tata McGraw Hill

NME-702: AUTOMOBILE ENGINEERING **L T P**
3 1 0

UNIT-I

Introduction:

Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

6

UNIT-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

8

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

5

Chasis and Suspension System:

Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system,Air suspension & shock absorbers.

5

UNIT-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

4

UNIT-V

Emission standards and pollution control :

Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives and modern trends in automotive engine efficiency and emission control.

5

Maintenance system:

Preventive maintenance, break down maintenance and over hauling.

2

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automobile Engineering –TTTI, Pearson India
5. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.
7. Automobile Engineering –Ramakrishna, PHI, India

NME:801 POWER PLANT ENGINEERING **L T P**

3 1 0

UNIT-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations.

3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor.s profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

3

UNIT-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

8

UNIT-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, ubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

6

UNIT-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.

3

Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.

4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

2

UNIT-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc.

2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms.

3

Pollution

Pollution due to power generation

2

Books and References:

1. Power Plant Engineering, by F.T. Morse, Affiliated East-West Press Pvt. Ltd
2. Power Plant Engineering by Hedge, Pearson India
3. Power Plant Technology, by Wakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
6. Power Plant Engineering by Gupta, PHI India
7. Power Plant Engineering. Mahesh Verma, Metropolitan Book Company Pvt. Ltd.

NPI- 801 : **QUALITY CONTROL** **L T P**
3 1 0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability.

3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation.

5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

8

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.

3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.
MTBF. Maintainability, Condition monitoring and dignostic techniques.

4

Value Engineering : Elements of value analysis, Techniques.

2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts.

6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

2

Books and Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

NME-751:CAD/CAM LAB

L	T	P
0	1	2

Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.

3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

NME-752: I.C. ENGINES AND AUTOMOBILE LAB

L	T	P
0	0	2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.

8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

DEPARTMENT ELECTIVE-III

NME-031: COMPUTER AIDED MANUFACTURING (CAM) **L T P**
3 1 0

UNIT-I

Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

8

UNIT-II

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system.
Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

8

UNIT -III

Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.
System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

8

UNIT -IV

NC Part Programming- (a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.
(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

8

UNIT-V

Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

8

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.
6. CAD/CAM: Concepts and Applications by Alavala, PHI India
7. Computer Aided Manufacturing, by Srinivas, Oxford University Press.

NME-032: PROJECT MANAGEMENT **L T P**
3 1 0

UNIT-I
Project Management Concepts
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

8

UNIT-II
Project Organization & Project Contracts
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

8

UNIT-III
Project Appraisal & Cost Estimation
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

8

UNIT-IV
Project Planning & Scheduling
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

8

UNIT-V
Modification & Extensions of Network Models
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-

essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

8

Books and References :

1. Project Management by Harvey Maylor, Pearson India
2. Project Management by Choudhury, McGraw Hill
3. Project Management by K. Nagarajan
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
5. Project Management: A Life Cycle Approach by Kanda, PHI, India
6. Project Management and Appraisal, byKhatua, Oxford University Press.

NME-033: COMPUTATIONAL FLUID DYNAMICS **L T P**
3 1 0

UNIT- I
GOVERNING EQUATIONS AND BOUNDARY CONDITIONS:
Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averagedequations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behavior of PDEs onCFD. Elliptic, Parabolic and Hyperbolic equations.

8

UNIT -II
FINITE DIFFERENCE METHOD:
Derivation of finite difference equations. Simple Methods. General Methods for first and second orderaccuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations . Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

9

UNIT- III
FINITE VOLUME METHOD (FVM) FOR DIFFUSION:
Finite volume formulation for steady state One, Two and Three dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

9

UNIT -IV
FINITE VOLUME METHOD FOR CONVECTION DIFFUSION:
Steady one-dimensional convection and diffusion. Central, upwind differencing schemes-properties ofdiscretization schemes. Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICKSchemes.

10

UNIT- V
CALCULATION FLOW FIELD BY FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and itsvariants. Turbulence models, mixing length model, Two equation (k-Є) models. High and low Reynoldsnumber models

9

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis .
3. Computational Heat Transfer, by Jaluria ans Torrance, CRC Press
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.
9. Computational Fluid Dynamics: Principles and Applications, by Blazek, Elsevier Science & Technology.

NME-034: COMPOSITE MATERIALS **L T P**
3 1 0

UNIT-1

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

7

UNIT-II

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential.

7

UNIT-III

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.

10

UNIT-IV

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix

performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

10

UNIT-V

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

6

Books and References :

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy, by G. Dieter, McGraw Hill
3. Analysis and Performance of Fiber Composites, by Agarwal, McGraw Hill
4. Thermal Analysis of Materials, by R.F. Speyer, Marcel Decker
5. Engineering Mechanics and Composite Materials , by Daniels, Oxford University Press.
6. Engineering Materials: Polymers, Ceramics and Composites, by A.K Bhargava Prentice Hall India
7. Material Science and Engineering (SIE) with CD, by Smith, McGraw Hill

DEPARTMENT ELECTIVE-IV

NME-041: TOTAL QUALITY MANAGEMENT (TQM) **L T P**
3 1 0

UNIT -I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

4

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

4

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

3

UNIT -II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

5

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

3

UNIT -III

Tools and Techniques

Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart).

3

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

3

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

3

UNIT -IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

6

UNIT -V

IS0-9000 and its concept of Quality Management

ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT in some details.

6

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.
3. TQM in New Product manufacturing, H. G. Menon, McGraw Hill.
4. Total Quality Management, by Suri, Wiley.
5. Total Quality Management, by Subburaj, McGraw Hill.
6. Total Quality Management, by Poornima Chantimath, Pearson India
7. Quality Management by Bedi, Oxford University Press.
8. Total Quality Management-Text and Cases, by Janakiraman & Gopal, PHI, India.
9. Total Quality Management, H. Lal, Eastern Limited.
10. Total Quality Management, A. Arivalagar , R. S. Naagarazan, New Age International.

NME-042: THERMAL TURBOMACHINES **L T P**
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbomachinery, Energy transfer in turbo machines, Euler's equation, Definition of variousefficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology,Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps.

8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoitydiagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient,Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guidevanes, Centrifugal Compressor characteristic curves.

4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocitydiagram for axial compressor, Factors affecting stage pressure ratio, Blockage incompressor annulus, Degree of reaction, 3-D flow, Design process, blade design,calculation of stage performance, Axial compressor performance characteristic curves.

4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocitydiagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord,Estimation of stage performance, Characteristic curves.

4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

4

Pumps : Classification of Pumps, Main components, indicator diagram and modificationdue to piston acceleration, Performance characteristics, Cavitation and its control,Miscellaneous types of pumps.

4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropydiagram, State losses, Estimation of stage performance, Performance characteristics.

4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustionsystem types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparativeevaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Designwith traditional materials.

8

Books and References:

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Fundamentals of Turbomachinery by Venkanna, PHI, India
3. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.

4. Gas Turbine- Ganeshan, Tata Mc Graw Hill.
5. Thermal Turbomachines, by Singh, Wiley
6. Fundamentals of Turbomachinery, by Venkanna, PHI, India.

NME – 043: MECHANICAL SYSTEM DESIGN **L T P**
3 1 0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, types of system, Application of system concepts, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

4

Problem Formulation : Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

4

UNIT-II

System Theories: Introduction, System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

4

System modeling

Introduction, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

4

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.

4

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

4

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.

4

Calculus Method for Optimization

Model with single decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

4

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

5

Books and References:

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Engineering Design, by Dieter, McGraw Hill
3. Design Engineering-JR Dixon, TMH, New Delhi
4. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
5. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
6. Optimization Techniques-SS Rao
7. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

NME-044: AUTOMATION AND ROBOTICS **L T P**
3 1 0

UNIT- I

AUTOMATION:

Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation.

Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

7

UNIT- II

Manufacturing Automation:

Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

7

UNIT- III

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source.

Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous

transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

9

UNIT -IV

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

9

UNIT- V

ROBOT SIMULATION

Methods of robot programming, Simulation concept, Off-line programming, advantages of off-line programming.

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

8

Books and Reference :

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India
5. Robotics , by J.J. Craig, Addison-Wesley.
6. Industrial Robots , by Groover, McGraw Hill.
7. Robots & Manufacturing Automation, by Asfahl, Wiley
8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India
9. Automation & Robotics, byGhoshal, Oxford University Press.
10. Introduction to AI Robotics, by Murphy, PHI, India.

DEPARTMENT ELECTIVE-V

NME-051: OPERATIONS RESEARCH **L T P**

3 1 0

UNIT-I

Introduction: Basic of Operation Research, Origin & development of Operation Research,Applications.

2

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

7

UNIT-II

Transportation Problem: Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced Transportation Problem.

4

Assignment Problem: Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

3

UNIT-III

Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming.

4

Sequencing: Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

3

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

4

Simulation: Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

4

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

3

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

6

Books and References:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley & Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand.
7. Operation Research Application and Algorithms, by- Wayne L Winston, Duxbury Press.
8. Operations Research, by Jha, McGraw Hill.
9. Operation Research, by Yadav & Malik Oxford University Press
10. Operations Research, by Panneerselvam, PHI, India

NME-052 : DESIGN OF THERMAL SYSTEMS **L:T:P**
3:1: 0

Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

5

Design & Selection of Air conditioning Apparatus **:**Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

3

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation. Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

8

Unit-III

Turbomachines:Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

8

Unit-IV

Design of Heat Exchanger :Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

8

Books and References:

1. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.
2. Refrigeration & Air Conditioning - By C.P. Arora, McGraw Hill
3. Refrigeration & Air Conditioning - By Manohar Prasad, New Age
4. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
5. Refrigeration & Air Conditioning Data Book – Manohar Prasad, New Age
6. ASHRAE Hand Book of Fundamentals-ASHRAE
7. Refrigeration & Air Conditioning-Stoecker & Jones, Mc Graw Hill
8. Design of High Efficiency Turbomachinery and Gas Turbine by Wilsonm and Korakianitis, PHI, India
9. Turbines compressors and Fans by Yahaya, Mc Graw Hill
10. Heat Transfer Equipment Design by Shah, CRC Press
11. Thermal System Design and Optimization by Balaji, Ane Books Pvt Ltd

NME-053: ADVANCE SYNTHESIS OF MECHANISMS

L T P
3 1 0

UNIT-I

Introduction:

Mechanisms: Classifications, Relative and absolute motion, degree of freedom, 4-barMechanisms, planar and spatial mechanisms, Inversion and equivalent linkage,Transmission angle.

4

Kinematic analysis of Planer motion: Relative velocity, Instantaneous centre, Poles and centrodes, Relative acceleration.

4

UNIT-II

Kinematic Synthesis: Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials.

4

Four bar linkage, Equation of coupler curves, Double points and symmetry, RobertChebyshev theorem, Approximate and exact straight line mechanisms .

4

UNIT-III

Graphical Synthesis of Mechanisms:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crankMechanism. Synthesis of four bar mechanisms.

8

UNIT IV

Analytical Synthesis:

Displacement equation of four bar linkage, Crank and follower synthesis with threeaccuracy points, Four bar function generator with three accuracy points, Crank andfollower synthesis, angular velocities and accelerations

8

UNIT-V

Analytical Synthesis:
Synthesis of slider crank mechanism with three accuracy points, Synthesis of slidercrank mechanism with four accuracy points, cam and follower mechanism, Analysis of mechanical errors in linkage.

8

Books and References:

1. Kinematic Synthesis of Linkages RS Hartenberg and J Denavit McGraw Hill, New York
2. Kinematic and Linkage Design AS Hall Jr Prentice Hall India Ltd.
3. Mechanism and Machine Theory Amitabh Ghosh and AK Mallick
4. Mechanism Design: Analysis &Synthesis Erdman & Sandor Prentice Hall of India
5. Kinematics and Dynamics of machinery (SIE), by Norton, McGraw Hill

NME-054: INDUSTRIAL AUTOMATION –I **L T P**
3 1 0

Unit-I:
Historical perspective of Industrial Automation
- Origin, Evolution and Need / Demand of automation in industries, Current and future Trends
- Components of Industrial Automation System and their functionalities, Layers and Types of Automation

6

Unit -II:
Automation Controllers
- Introduction of Industrial Controllers
- Programmable Logic Controller: Constructions, Types, Programming Units, Memory, I/O Modules.
- Programming methodology
- Ladder Logic programming for Industrial Applications, Timers and Counters
- Selection criteria of PLC
- Examples of PLC application

10

Unit-III:
Industrial Switching Elements
- Electronic Logic gates
- Relays, Solenoids
- Pneumatic Valves and Actuators
- Hydraulic valves and Actuators
- Interfacing: Control of Hydraulics and Pneumatics with Electric Signals
- Comparison between different switching elements

10

Unit-IV:
Visualization: Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA) Systems:

- Need for HMI
- Hardware based HMI panels
- PC based HMI Systems – SCADA
- Different Functionalities
- Benefits of implementing SCADA systems
- Case Studies of SCADA implementation.

10

Unit V:

Case Study

- Hydraulic / Pneumatic Press
- Material handling System
- Machine Tool: NC/CNC Machine

4

Books and References :

1. Programmable Logic Controllers with Control Logix, by Jon Stenerson, Delmar Publishers, 2009.
2. Hand book of industrial Automation, by Richard L Shell and Ernest L Hall, Marcel Dekker Inc., 2000.
3. Practical SCADA for Industry, by David Bailey and Edwin Wright, Newness Publishers, 2003.
4. Automation network Selection, by Dick Caro, ISA – The Instrumentation Systems and Automation Society, 2004.
5. Getting Factory Automation Right (the first time), by Edwin H Zimmerman, Manufacturing Engineers, 2001.
6. Automation, Production Systems and Computer Integrated Manufacturing, by Groover, Pearson India.
7. Industrial Instrumentation and Control, by Singh, McGraw Hill.

NME-055: ADVANCED WELDING TECHNOLOGY **L T P**
3 1 0

UNIT-I

Introduction: Welding as compared with other fabrication processes,Importance and application of welding, classification of welding processes, Health & safety measures in welding.

3

Welding Power Sources: Physics of welding Arc**,** Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

3

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

4

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

3

UNIT-II

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrogas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

11

UNIT-III

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

5

UNIT-IV

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

2

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.

4

UNIT-V

Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

5

Books and References:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principals and Practices, by- Edwars R. Bohnart, McGraw Hill Education.
3. Welding Engineering and Technology, by- R. S. Parmar, Khanna Publishsers.
4. Welding Handbooks (Vol. I & II).

DEPARTMENT ELECTIVE-VI

NME- 061: EXPERIMENTAL STRESS ANALYSIS **L T P**
3 1 0

UNIT -I

Stress: Introduction, Two-Dimensional State of Stress, Equations of Equilibrium, Stress Transformation relations, principal Stresses, Special States of Stress.

4

Strain: Introduction, Displacement and Strain, Strain Transformation relations, principal strains, Stress Strain Relations, for Two-Dimensional State of Stress.

4

UNIT- II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis.

4

Brittle Coating Method: Introduction, Coating Stresses, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

4

UNIT -III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor.

4

Strain Gage Circuit: Potentiometer, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.Three Element Rectangular Rosette

4

UNIT- IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Stressed Model in Circular Polariscope.

8

UNIT -V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method.

8

Books and References :

1. Experimental Stress Analysis, by U C Jindal, Pearson India
2. Experiment Stress Analysis, by James W. Dally and William F. Riley, McGraw-Hill International
3. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.
4. Advance Strength and Applied Stress Analysis, by Budynas, McGraw-Hill

NME- 062: PLANT LAYOUT AND MATERIAL HANDELING **L T P**
310

UNIT -I

Introduction

Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

8

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design

Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

8

UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic.

Material Handling: Material handling principles; material handling equipment and material handling systems.

8

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. **Warehouse operations**: function, storage operations.

Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems,

Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.

8

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

8

Books and References:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6. Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons.
7. Plant Design and Economics, by- Peters, McGraw Hill Education.
8. Purchasing and Material Management, by- Gopalakrishnan, McGraw Hill Education.

NME-063: ADDITIVE MANUFACTURING

L	T	P
3	1	0

UNIT-I

Introduction

History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, **Direct and Indirect Processes;** Prototyping, Manufacturing and Tooling.

4

Layer Manufacturing Processes; Polymerization, Sintering and Melting, Extrusion, Powder-Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosolprinting and Bioplotter.

4

UNIT-II

Development of Additive Manufacturing Technology

Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems.

3

Generalized Additive Manufacturing Process Chain; The Eight Steps in Additive Manufacturing, Variation from one AM Machine to Another, Metal System, Maintenance of Equipment, Material Handling Issue, Design of AM.

5

UNIT-III

Additive Manufacturing Processes

Vat Photopolymerization; Materials, Reaction Rates, Photopolymerization Process Modeling, Scan Patterns, **Powder Bed Fusion Processes;** Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling, **Extrusion Based System;** Basic principles, plotting and Path Control, Bioextrusion, Other Systems, **Material Jetting;** Materials, Material Processing Fundamentals, Material Jetting Machines, **Binder Jetting;** Materials, Process Variations, BJ Machines, **Sheet lamination Processes;** Materials, Ultrosonic Additive Manufacturing, **Directed Energy Deposition Processes;** General DED Process Description, Material Delivery, DED systems, Process Parameters, Processiong-Structure-Properties Relationships, **Direct Write Technologies;** Ink-Based DW, laser Transfer DW, Thermal Spray DW, Beam Deposition DW, Liquid Phase Direct Deposition, Hybrid Technologies.

8

UNIT-IV

Design & Software Issues

Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM.

4

Software Issue for Additive Manufacturing; Introduction, Preperation of CAD Models: The STL file, Problem with STL file, STL file Manupulation, Beyond the STL file, Additional Software to Assist AM.

4

UNIT-V

Material Design & Quality Aspects

Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Intellectual Property, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing, Business Opportunities

4

Applications

Aerospace, Automotive, Manufacturing, Architectural Engineering, Art, Jewelry, Toys, Medical, Biomedical, Dental, Bio-printing, Tissue & Organ Engineering and many others.

4

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson , DSavid W. Rosen , Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
4. Rapid Prototyping: Principles and Applications, by - Chee Kai Chua, Kah Fai Leong, Chu Sing Lim.

NME-064: COMPUTER AIDED PROCESS PLANNING **L T P**
3 1 0

UNIT-I

Introduction to CAPP: Principles, scope and information requirement for CAPP, Role of process planning, Manual and experienced based process planning, Advantages of CAPP over conventional process planning, Decision table and decision trees, process capability analysis, Tolerance analysis, Variant process planning, Generative approach, Forward and Backward planning.

8

UNIT-II

Computer Aided Process Planning: Logical design of process planning systems, Implementation considerations, Computer based process monitoring and control, Computer and process interfacing, Totally integrated process planning systems, Process planning for rotational and prismatic parts, Machining of curves and surfaces, Five axis machining, Process planning of freedom surfaces, Development of NC codes, Computer aided design of fixtures, Inspection policies and inspection planning, Expert systems and their use in developing process planning systems.

8

UNIT-III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications. Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples. Generative CAPP system: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

8

UNIT-IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes, design and manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances.

8

UNIT-V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods. Implementation techniques for CAPP: MIPLAN system, Computer programming languages tbr CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

8

Books and References:

1. Production Systems and Computer Integrated Manufacturing System, by- Mikell P Groover, Prentice Hall.
2. Computer Processing of Remotely Sensed Images: An Introduction, 3rd Edition, by- Mather Paul, Wiley.
3. Computer Aided Process Control, by- SK Singh, PHI Learning Pvt. Ltd.
4. Computer Aided Design and Manufacturing, by- M. Sarcar, K. L. Narayan, PHI Learning Pvt. Ltd.

NME-065: NON-DESTRUCTIVE TESTING **L T P**
3 1 0

Unit-I

Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

6

Unit-II

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zyglo test, Illustrative examples and interpretation of defects.

5

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Non-ferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

5

Unit-III

Radiographic methods

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ-ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

8

Unit-IV

Ultrasonic testing methods

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

8

Unit-V

Special NDT Techniques

Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

8

Books and References:

1. Non-Destructive Testing and Evaluation of Materials, by- Prasad, McGraw Hill Education.
2. Basics of Non-Destructive Testing, by Lari & Kumar, KATSON Books.
3. Practical Non-destructive Testing, by- Baldev Raj, T. Jayakumar, M. Thavasimuthu, Woodhead Publishing.
4. Non-Destructive Testing Techniques, by- Ravi Prakash, New Age International.
5. Nondestructive Testing Handbook,by Robert C. McMaster, American Society for Nondestructive.
6. Introduction to Nondestructive Testing: A Training Guide, by- Paul E. Mix, wiley.
7. Electrical and Magnetic Methods of Non-destructive Testing, by- J. Blitz, springer.

Syllabus 2017-18

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

LUCKNOW

Study & Evaluation Scheme with Syllabus

for

B.Tech. Second Year

Civil Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
4.	RCE301	Building Materials & Construction	3-1-0	70	20	10	100	4
5.	RCE302	Surveying	3-0-0	70	20	10	100	3
6.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
7.	RCE351	Building Materials Lab	0-0-2	50	30	20	100	1
8.	RCE352	Surveying Lab	0-0-2	50	30	20	100	1
9.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
10.	RCE354	Computer Based Statistical & Numerical Techniques Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	RCS405	Data Structures	3-0-0	70	20	10	100	3
4.	RCE401	Hydraulics & Hydraulic Machines	3-0-0	70	20	10	100	3
5.	RCE402	Geoinformatics	3-0-0	70	20	10	100	3
6.	RCE403	Structural Analysis	3-1-0	70	20	10	100	4
7.	RCE452	Geoinformatics Lab	0-0-2	50	30	20	100	1
8.	RCE453	Structural Analysis Lab	0-0-2	50	30	20	100	1
9.	RCE454	Building Planning & Drawing Lab	0-0-2	50	30	20	100	1
10.	RCE455	Hydraulics & Machine Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Industrial Training:
Students will go for Industrial Training of 8-10 weeks in total in two parts (Industrial Training-1 & Industrial Training-2) which is to be evaluated in VII semester after submission of separate training report for each part.
Industrial Training-1: Students will go to Industrial Training-1 of 4 weeks after IV semester which will be evaluated in VII semester.

Science Based Open Electives:
a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

RCE301: BUILDING MATERIALS & CONSTRUCTION

UNIT I

Scope of Study of building Materials: building materials and their performance, economics of the building materials. **Stones:** Requirement of good building stone, characteristics of building stone sand their testing. Common building stones. Methods of preservation of stones. **Bricks**: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. **Gypsum**: properties of gypsum plaster, building products made of gypsum and their uses. **Lime**: Manufacture of lime, classifications of limes, properties of lime. **Cement**: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement. **Cement Concrete**: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete. **Pozzolona**: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. **Timber**: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor saffecting strength of timber, Methods of seasoning and preservation of timber. Wood based products. **Asphalt:** Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

UNIT II

Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. **Paint svarnishes and distempers:** Common constituents, types and desirable properties, Cement paints. **Ferrous metals:** Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcings telemechanical and physical Properties chemical composition. Brief discussion on properties and uses of Aluminum and lead. **Glass**: Ingredients, properties types and use in construction. **Insulating Materials**: Thermal and sound insulating material, desirable properties and types.

UNIT III

Buildings: Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, antitermite treatment in buildings, Vertical circulation means: stair cases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonary construction. Cavity wall & hollow block construction.

UNIT IV

Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning.

UNIT V

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance.

References:

1. SK Duggal, “Building Materials” New Age International
2. Purushothama Raj, “Building Construction Materials & Techniques” Pearson Edu.
3. PC Varghese, “Building Materials” PHI
4. Rangwala, “Building Materials” Charotar Publishing House.
5. Sushil Kumar, “Building Construction” Standard Publisher.
6. Domone, “Construction Materials” 4/e, CRC Press Taylor & Francis Group.
7. Adams, “Adams’ Building Construction Adams” CRC Press Taylor & Francis Group.
8. BC Punmia, “Building Construction” Laxmi Publication.
9. Jha & Sinha, “Building Construction” Khanna Publishers
10. Sahu, “Building Materials and Construction” Mc Grew Hill Education
11. Deodhar, “Civil Engineering Materials” Khanna Publishers
12. Mehta, “Building Construction Principles, Materials & Systems” 2/e, Pearson Education Noida.
13. Sandeep Mantri, “Practical building Construction and its Management” Satya Publisher, New Delhi.

RCE302: SURVEYING

UNIT I

Surveying: definition, divisions, classification and principles of surveying. Scales: plain, vernier, diagonal, plan and map. Accuracy and errors: definitions, sources and kinds of errors, application of probability for computation of errors, laws of weights.

UNIT II

Linear measurement: chain and tape surveying, types of chain and tape, ranging, obstacles and tape correction. Compass surveying: Measurement of directions, Reference meridians, bearing and azimuths, local attraction. Theodolite survey: Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control,working of Electronic Theodolites.

UNIT III

Leveling: Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, use of Automatic level, Digital Level, Vertical Control. Contouring: contours, contour interval, horizontal equivalent, characteristics, methods and interpolation, use to prepare profiles. Tachometry: Principles of stadia systems, subtense bar and tangential methods.

UNIT IV

Traversing and triangulation: Principles of traversing by compass and theodolite, computations of traverse coordinates, omitted measurements, Principles and classification of triangulation systems, strength of figures, satellite stations, and triangulation field work. Introduction to modern surveying Instruments /Techniques like total station.

UNIT V

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. Survey Layout for culverts, canals, bridges, road/railway alignment and buildings.

References:

1. Schofield, “Engineering Surveying” 6/e, CRC Press Taylor & Francis Group.
2. BC Punamia et al: Surveying Vol. I, II, Laxmi Publication
3. Bannister, “Surveying” 7/e, Pearson Education, Noida.
4. AM Chandra: Plane Surveying, Higher Surveying, Narosa Pub.
5. AK Dey Plain Survey, S Chand
6. SK Duggal: Surveying Vol. I, II.
7. R Subramanian : Surveying & Leveling , Oxford University Press
8. C Venkatramaih : Text Book of Surveying , University Press
9. Charles D. Ghilani, Elementary Surveying Pearson Education
10. R. Agor, “Surveying and Levelling” Khanna Publishers.

RCE303: FLUID MECHANICS

UNIT I

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

UNIT III

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control.

UNIT V

Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance.

References :

1. Hibbler, "Fluid Mechanicsin SI Units" 1/e Pearson Education, Noida.
2. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,
3. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
4. Katz, "Introductory Fluid Mechanics" Cambridge University Press
5. Pnueli & Gutfinger, "Fluid Mechanics" Cambridge University Press
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida
8. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor & Francis Group.
9. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor & Francis Group.
10. AK Jain "Fluid Mechanics" Khanna Publication.
11. White,F.M. "Fluid Mechanics" TMH, New Delhi.
12. Munsen et al , "Fundamental of Fluid Mechanics" Wiley Newyork Ltd

13. Garde, R.J., " Fluid Mechanics", SciTech Publications Pvt. Ltd
14. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student.
15. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
16. Jagdish Lal "Fluid Mechanics"
17. N Narayan Pillai " Principles of Fluid Mechanics & Fluid Machines" Universities Press.
18. Esposito, Fluid Power & Applications" 7/e Pearson Education, Noida.
19. DR Malhotra & Malhotra, "Fluid Mechanics Hydraulics & Hydraulic Machines" Satya Prakashan, New Delhi.

RCE351/ RCE451: BUILDING MATERIALS LAB

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

RCE352: SURVEYING LAB

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method.
10. To plot contour map of given area.

RCE353: FLUID MECHANICS LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

RCE354: COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

Write computer program in C/C^{++} /visual basic for mathematical and engineering solutions.

1. Write a code for finding out the root of the algebraic and transcendental equations using Newton-Raphson's iterative method.
2. Write a computer program for inversion of matrix.
3. Write a computer program for Eigen value solution of matrix.
4. Write a computer program for Runge Kutta fourth order method (RK4) to solve ordinary differential equation.
5. Write a computer program to find the engineering properties of I and channel sections.
6. Write a computer program to solve simultaneous linear equations.
7. Write the program to implement the Gauss forward interpolation formula and back ward interpolation formula.
8. Write code for one dimensional heat equation and one dimensional fluid flow problem (boundary value problem).

RCE401: HYDRAULICS & HYDRAULIC MACHINES

UNIT I

Introduction : Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critcal and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections.

UNIT II

Energy-Depth relationship: Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods.

UNIT III

Rapidly varied flow: hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds. Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

UNIT IV

Impulse momentum equation- Impact of Jets-plane and curved- stationary and moving plates.
Pumps: Positive displacement pumps - reciprocating pumps - operating principles -slip - indicator diagram - separation- air vessels. centrifugal pumps - operation - velocity triangles - performance curves - Cavitation - Multi staging - Selection of pumps.

UNIT V

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References:

1. Chow,V.T. "Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
8. AK Jain "Fluid Mechanics" Khanna Publication.
9. Houghtalen, "Fundamentals of Hydraulics Engineering Systems" 4/e Pearson Education, Noida.

RCE402: GEOINFORMATICS

UNIT I

Photogrammetric Survey, basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.

UNIT II

Remote Sensing, Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites.

UNIT III

Digital image processing: introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.

UNIT IV

GIS system: Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.

UNIT V

Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications.

References:

1. Sateesh Gopi, R Sathkumar & N Madhu “Advanced Surveying GIS & Remote Sensing” Pearson Education.
2. Kang Tshung Chang “Introduction of Geographic Information Systems” TMH.
3. Campbell, “Introduction to Remote Sensing” 3/e, CRC Press Taylor & Francis Group.
4. Chen, “Signal and Image Processing for Remote Sensing” CRC Press Taylor & Francis Group.
5. A M Chandra: Higher Surveying Narosa Pub.
6. B C Punamia: Higher Surveying Laxmi Publication
7. T M Lillesand et al: Remote Sensing & Image Interpretation
8. R. Agor, “Advanced Surveying” Khanna Publishers.
9. B. Bhatta: Remote Sensing & GIS TMH.
10. M Anjireddy: Remote Sensing & GIS, BS Publications
11. Narayan Panigrahi “Geographical Information Science” Universities Press.

12. N K Agarwal: Essentials of GPS, Spatial Networks: Hyderabad.
13. George Joseph “Fundamental of Remote Sensing” Universities press.
14. GS Srivastava “An Introduction to Geoinformatics” TMH.
15. Ahmed EI Rabbany, “Introduction to GPS The Global Positioning System” Artech House, Boston.
16. Chor Pang Lo, “Concepts & Techniques of Geographic Information Systems” 2/e, Pearson Education

RCE403: STRUCTURAL ANALYSIS

UNIT I

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable.

UNIT II

Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.

UNIT III

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's theorems, Calculations of deflections: Strain Energy Method, unit load method& for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method.

UNIT IV

Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures.

UNIT V

Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.

References

1. Hibbler, "Structural Analysis", Pearson Education
2. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
3. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
4. T S Thandavmorthy, "Analysis of Structures", Oxford University Press 5.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
5. Temoshenko & Young "Theory of Structure" Tata Mc Grew Hill.
6. Reddy, CS, "Basic Structural Analysis", Tata McGraw Hill.
7. Jain, OP and Jain, BK, "Theory & Analysis of Structures ". Vol.I & II Nem Chand.
8. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
9. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
10. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
11. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
12. S Ramamurtham "Theory of Structure" Dhanpat Rai.
13. Devdas Menon "Advanced Structural Analysis" Narosa
14. Wang, CK, "Intermediate Structural Analysis", Tata Mc-Graw Hill.
15. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
16. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis

Group.
17. Bibek Kumar Mukherjee, “Theory and Analysis of Structures” Satya Prakashan, New Delhi.
18. Jacques Heyman, “Structural Analysis” Cambridge University Press.

RCE452: GEOINFORMATICS LAB

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

RCE453: STRUCTURAL ANALYSIS LAB

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell’s Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

RCE454: BUILDING PLANNING & DRAWING LAB

Drawing and drafting of following with CAD software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

RCE455: HYDRAULICS & MACHINE LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc.

U. P. TECHNICAL UNIVERSITY,
IET CAMPUS, SITAPUR ROAD, LUCKNOW- 226 021

COURSE STRUCTURE AND SYLLABUS
(EFFECTIVE FROM Session: 2015-16)

B.Tech. (Civil Engineering)

Third Year (5th & 6th Semester)

JULY 10, 2015

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 5th Semester

S.No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
2	NCE 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	NCE 502	Transportation Engineering-1	3	1	0	30	20	50	100	150	4
4	NCE 503	Environmental Engineering-1	2	1	0	15	10	25	50	75	3
5	NCE 504	Structural Analysis-2	3	1	0	30	20	50	100	150	4
6	NCE 505	Design of Concrete Structure-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	NCE 551	Geotechnical Engineering Lab	-	-	3	10	10	20	30	50	1
8	NCE 552	Transportation Engineering Lab	-	-	3	10	10	20	30	50	1
9	NCE 553	CAD Lab-1	-	-	3	10	10	20	30	50	1
10	NCE 554	Estimation Costing & Valuation			3	10	10	20	30	50	1
11	NGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		TOTAL	16	5	12					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 6th Semester

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
2	NCE 601	Design of Concrete Structure-2	3	1	0	30	20	50	100	150	4
3	NCE 602	Environmental Engineering-2	3	1	0	30	20	50	100	150	4
4	NCE 603	Construction Technology & Management	3	1	0	30	20	50	100	150	4
5	NCE 011 -014	Departmental Elective-1	3	1	0	30	20	50	100	150	4
6	NCE 021-024	Departmental Elective-2	2	1	0	15	10	25	50	75	3
PRACTICAL/DRAWING/DESIGN											
7	NCE 651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
8	NCE 652	Environmental Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCE 653	CAD Lab-2	0	0	3	10	10	20	30	50	1
10	NCE 654	Survey Camp*	0	0	0	0	0	50		50	1
11	NGP 601	General Proficiency	0	0	0	0	0	50	-	50	
		TOTAL	16	5	9					1000	25

Note:*The teaching load of survey camp will be counted as equivalent to 0-0-3.

Departmental Elective -1 (Full Unit Course with Credit: 4)

Sl.No.	Code and Course
5 (A)	NCE 011 – Advanced Foundation Design
5 (B)	NCE 012 – Matrix Analysis of Structures
5 (C)	NCE 013 – Environmental Management for Industries
5 (D)	NCE 014 – Principals of Town Planning and Architecture

Departmental Elective – 2 (Half Unit Course with Credit: 3)

Sl.No.	Code and Course
6 (A)	NCE 021 – Advanced Concrete Design
6 (B)	NCE 022 – Earth and Earth Retaining Structure
6 (C)	NCE 023 – Transportation System and Planning
6 (D)	NCE 024 – Rural Water supply and Sanitation

5.2 NCE – 501: GEOTECHNICAL ENGINEERING

L– 3, T– 1, P- 0
CT–30, TA–20, ESE -100

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton' s pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and c-φ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies.
Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & References Books

1. **V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)**
2. **K.R. Arora – Soil Mechanics and Foundation Engineering**
3. **Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.**
4. **Alam Singh – Modern Geotechnical Engineering**
5. **Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning**
6. **I.H. Khan – Text Book of Geotechnical Engineering**
7. **C. Venkataramaiah – Geotechnical Engineering**
8. **Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics**
9. **G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics**
10. **P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.**
11. **Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering**
12. **Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.**

5.3 NCE – 502: TRANSPORTATION ENGINEERING-I

L-3, T-1, P-0

CT-30, TA-20, ESE-100

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR)

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications,

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Book:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.**
2. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**

References:

3. **Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi – 110 006**
4. **Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi**
5. **Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.**
6. **Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.**
7. **Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,**
8. **IRC : 37-2012, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi**

9. IRC: SP:68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
10. IRC: 58-2011, "Guidelines for The design of Plain Jointed Rigid Pavements for Highways", Indian Roads Congress, New Delhi.
11. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
12. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

5.4 NCE – 503 ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1, P -0
CT – 15, TA – 10, ESE – 50

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.
Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.
Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.
Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient

air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books:

1. **Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**
2. **Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.**
3. **Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).**
5. **Seinfeld, J.H. and Pandis, S.N. "Atmospheric Chemistry and Physics: From Air Pollution to Climate Change", John Wiley**
6. **http://cpcb.nic.in/, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.**

References:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
2. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
3. **Steel and McGhee: Water Supply and Sewerage**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Hammer and Hammer Jr.: Water and Wastewater Technology**
6. **Raju: Water Supply and Wastewater Engineering**
7. **Rao: Textbook of Environmental Engineering**
8. **Davis and Cornwell: Introduction to Environmental Engineering**
9. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
10. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
11. **Birdie: Water Supply and Sanitary Engineering**
12. **Ramalho: Introduction to Wastewater Treatment Processes**
13. **Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**

5.5 NCE - 504: STRUCTURAL ANALYSIS-2

L-3, T -1, P-0

CT– 30, TA– 20, ESE- 100

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **Jain, A. K.,"Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.**
2. **Hibbeler, R.C.,"Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309**
3. **C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.**
4. **Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem**
5. **Chand & Bros., Roorkee.**
6. **Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.**
7. **Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.**

8. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
9. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
10. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi..

5.6 NCE - 505: DESIGN OF CONCRETE STRUCTURE-1

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly
Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.
2. The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **IS: 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
4. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
5. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
6. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
7. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**
8. **Sinha, S.N., "Reinforced Concrete Design" Mc-Graw Hill Book Publishing Company Ltd., New Delhi**
9. **Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press,New Delhi – 110 001.**

5.7 NCE – 551: GEOTECHNICAL ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. **Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.**
2. **Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.**
3. **Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.**
4. **Determination of relative density of a given soil sample.**
5. **Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.**
6. **Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).**
7. **Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).**
8. **Determination of compaction characteristics (OMC & MDD) of a given soil sample.**
9. **Determination of permeability of a remolded soil sample by constant head &/or falling head method.**
10. **Determination of consolidation characteristics of a remolded soil sample by an oedometer test.**
11. **Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.**

12. **Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.**

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. **Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.**

5.8NCE – 551: TRANSPORTATION ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

LIST OF EXPERIMENTS

1. **To Determine the Crushing Value of Coarse Aggregates.**
2. **To Determine the Impact Value of Coarse Aggregates.**
3. **To determine the Flakiness Index and Elongation Index of Coarse Aggregates.**
4. **To determine the Los Angeles Abrasion Value of Coarse Aggregates.**
5. **To determine the Stripping Value of Coarse Aggregates.**
6. **To determine the penetration Value of Bitumen.**
7. **To determine the Softening Point of Bituminous material.**
8. **To determine the Ductility Value of Bituminous material.**
9. **To determine the Flash and Fire Point of Bituminous material.**
10. **To determine the Stripping Value of Bituminous material.**
11. **Classified both directional Traffic Volume Study.**
12. **Traffic Speed Study. (Using Radar Speedometer or Enoscope).**
13. **Determination of CBR Value of soil sample in the Lab or in Field.**

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**
2. **Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.**

3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

5.9 NCE - 553: CAD LAB I

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

5.10 NCE - 553: ESTIMATION COSTING & VALUATION

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., "Estimation and Costing in Civil Engineering (Theory and Practice)", UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, "A Text book of Estimation Costing and Valuation" Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., "Estimating Construction Costs" Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

6.2 NCE- 601 DESIGN OF CONCRETE STRUCTURE II

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References

1. **IS : 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete : Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Dayaratnam, P, "Limit State Design of Reinforced Concrete Structures" Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.**
4. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
5. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
6. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
7. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
8. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**

6.3 NCE-602: ENVIRONMENTAL ENGINEERING – 2

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets.

Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc.

Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Other emerging technologies for wastewater treatment: Duckweed pond,

vermiculture, root zone technologies, sequential batch reactor (SBR) etc. Solid waste Management: Definition of solid waste and its classification, Hazardous waste, Prevailing regulations of solid waste management in India. Noise Pollution: Definition, Sources, Prevailing noise standards in India.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

Text books:

1. **Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.**
2. **Metcalf and Eddy Inc.: Wastewater Engineering**
3. **Garg: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).**
5. **Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.**

Reference books:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban**
2. **Development, Government of India, New Delhi**
3. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Arceivala: Wastewater Treatment for Pollution Control**
6. **Hammer and Hammer Jr.: Water and Wastewater Technology**
7. **Raju: Water Supply and Wastewater Engineering**
8. **Sincero and Sincero: Environmental Engineering: A Design Approach**
9. **Pandey and Carney: Environmental Engineering**
10. **Rao: Textbook of Environmental Engineering**
11. **Davis and Cornwell: Introduction to Environmental Engineering**
12. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
13. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
14. **Birdie: Water Supply and Sanitary Engineering**
15. **Ramalho: Introduction to Wastewater Treatment Processes**
16. **Parker: Wastewater Systems Engineering**

6.4 NCE-603: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owing and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira " Construction Planning Equipment and Methods" McGraw Hills Education (India), Private Ltd.,New Delhi.**
2. **Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.**
3. **Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad – 500 004**
4. **Construction Management by Ojha**
5. **Srivastava, U.K.,"Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.**
6. **Construction Technology By Sarkar, Oxford.**

DEPARTMENTAL ELECTIVE – 1 SUBJECT (NCE-011 to NCE-014)

6.5 (A) NCE-011: ADVANCED FOUNDATION DESIGN

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit -1

Modern methods of soil investigations ,Geophysical methods; soil resistivity methods seismic refraction method ,stress below ground due to loads

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmertman's methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour,

Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads ,Machine foundation: classification, definitions, design principle in brief, Barken's method.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & Reference Books:

1. **K. R. Arora – Soil Mechanics & Foundation Engineering.**
2. **Alam Singh – Modern Geotechnical Engineering.**
3. **Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics**
4. **J. E. bowles – Analysis and Design of Foundation.**
5. **V. N. S. Murthy – Soil Mechanics and Foundation Engineering.**
6. **B. M. Das – Foundation Engineering, CENGAGE Learning**

6.5 (B) NCE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE - 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2
Hand computation of problems on trusses, frames and grids.

UNIT – 3
Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Reference:

1. **Weaver & Gere, Matrix Analysis of Framed structures.**
2. **H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill New York**
3. **Pandit, G.S.," Structural Analysis: A Matrix Approach" McGraw Hill Education (India) Pvt. Ltd., Noida.**

6.5(C) NCE – 013: ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw

materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC):Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ.

References:

1. **EIA Manuals of MOEF (Available on http://envfor.nic.in/essential-links/eia-specific-manuals and http://envfor.nic.in/division/introduction-8)**
2. **Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website**
3. **Environmental Impact Assessment-Training resource manual, UNEP 2001**
4. **Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,**
5. **George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.**
6. **Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.**
7. **Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.**
8. **Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi**

6.5 (D) NCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit - 1

Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic arid social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.

Unit - 2

An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.

Unit -3

Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.

Unit - 4

Elements of Architectural Design: Line. Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.

Unit - 5

Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
4. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
5. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
6. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
7. Nelson P. Lewis, Planning to Modern City, Routledge.
8. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
11. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
12. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
13. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi
14. National Building Code of India, latest edition

DEPARTMENTAL ELECTIVE –2 SUBJECT (NCE-021 to NCE-024) (Half Unit Course)

6.6 (A) NCE-021: ADVANCED CONCRETE DESIGN

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit - 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.

Unit - 2

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

Unit - 3

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under-concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab and R.C. T-beam types.

Unit - 4

High performance concrete, Production and no -conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Reinforced Concrete Design by M L Gambhir**
2. **Reinforced Concrete Design by B C Punamia**
3. **Essentials of Bridge Engineering by D.J. Victor**

6.6 (B) NCE- 022: EARTH AND EARTH RETAINING STRUCTURE

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis. Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability

Unit -2

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit - 3

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface-friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -4

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **V N S Murthy - Soil Mechanics and Foundation Engg**
2. **Swami Saran - Reinforced Soil and its Engineering Application**
3. **J. E. Bowles - Analysis and Design of Foundation.**
4. **B. M. Das - Foundation Engineering , CENGAGE Learning**
5. **P.C Varghese- Foundation Engineering, PHI Learning Pvt. Ltd., Delhi**
6. **N.N.SOM, S.C.Das, Theory and Practice of Foundation Design, PHI Learning Pvt. Ltd., Delhi**

6.6 (C) NCE-023: TRANSPORTATION SYSTEM AND PLANNING

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Goals and objective of Transportation planning,

UNIT-2-

Type of transportation system: Different modes of surface transport, Public Transport Intermediate Public Transport (IPT), Rapid and mass transport system like MRTS & bus rapid transit. Traffic Flow and traffic stream theory & variables, Queing theory.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Introduction to Transportation Engineering: William W. Hay.**
2. **Introduction to Transportation Engineering planning- E.K.Mortak.**
3. **Metropolitan Transportation planning-J.W.Dickey.**
4. **Traffic Engineering, L.R. Kadiyali**
5. **Banks, James H., "Introduction to Transportation Engineering", McGraw Education (India), Pvt. Ltd., Noida.**

6.6 (D) NCE-024: RURAL WATER SUPPLY AND SANITATION

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.
Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.**
2. **Operation and maintenance of rural water supply and sanitation systems by Brikké F**
3. **'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.,**
4. **WHO 'Water Supply and Sewerage', by E.W.Steel & T.J.Mcghee, McGraw Hill.**
5. **'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.**

6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

6.7 NCE- 651: STRUCTURAL DETAILING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt. Ltd., Hyderabad.

6.8 NCE-652: ENVIRONMENTAL ENGINEERING LAB

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM_{10} with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

Note: Any 8 Experiments out of the list of experiments are to be performed.

References:

1. **A.P.H.A. "Standard Methods for the Examination of Water and Wastewater", American Public Health Association.**
2. **Sawyer, C.N., McCarty, P.L. & Parkin, G.F. "Chemistry for Environmental Engineering", Mc-Graw Hill.**
3. **Mathur, R.P. "Water & Wastewater Testing", Lab Manual, Roorkee.**

6.9 NCE-653: CAD LAB II

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. **Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)**
2. **Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.**
3. **Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)**
4. **Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)**

6.10NCE-654: SURVEY CAMP

TOTAL MARKS: 50

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map.

The course will be run in the form of a camp for 7 working days and will involve the following components:

1. **Reconnaissance of the area to be mapped.**
2. **Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.**
3. **Detail digital mapping using Total station/GPS.**
4. **Preparing a digital map using open source mapping software and report writing.**

Note: Teaching load will be equivalent to 0-0-3.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

OPEN ELECTIVE-I

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

OPEN ELECTIVE-II

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (*λ*), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial

processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI

6. French, R.H., Open channel Hydraulics, McGraw Hill International

7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of

power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford & Haddow's analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. **2**

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. **8**

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme

technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

(Computer Science and Engineering, Computer Engg. & Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE030, 032 to 037, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
4.	RCS301	Discrete Structures & Theory of Logic	3-0-0	70	20	10	100	3
5.	RCS302	Computer Organization and Architecture	3-0-0	70	20	10	100	3
6.	RCS305	Data Structures	3-1-0	70	20	10	100	4
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	RCS351	Discrete Structure & Logic Lab	0-0-2	50	30	20	100	1
9.	RCS352	Computer Organization Lab	0-0-2	50	30	20	100	1
10.	RCS355	Data Structures Using C/ Java Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE040, 042 to 047, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC405	Introduction to Microprocessor	3-0-0	70	20	10	100	3
4.	RCS401	Operating Systems	3-0-0	70	20	10	100	3
5.	RCS402	Software Engineering	3-0-0	70	20	10	100	3
6.	RCS403	Theory of Automata and Formal Languages	3-1-0	70	20	10	100	4
7.	RCS451	Operating Systems Lab	0-0-2	50	30	20	100	1
8.	RCS452	Software Engineering Lab	0-0-2	50	30	20	100	1
9.	RCS453	TAFL Lab	0-0-2	50	30	20	100	1
10.	RCS454	Python Language Programming Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

RCS301: DISCRETE STRUCTURES & THEORY OF LOGIC

UNIT I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

UNIT II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo n.

UNIT III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.

UNIT IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

UNIT V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill
3. YN Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and SC Ross, “Discrete Mathematical Structures”, PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, “Discrete Mathematics”Oxford Higher Education.
7. Biswal, “Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, “Discrete Mathematics with Graph Theory”, PHI Learning Private Limited, Delhi India.
9. Lipschutz, “Discrete Mathematics”, McGraw Hill
10. Deo N., “Graph Theory with Applications to Engineering and Computer Science”, PHI Learning Private Limited, Delhi India

RCS302: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT II

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

UNIT III

Basic concept and hierarchy, semiconductor RAM memories, 2D & $2\frac{1}{2}D$ memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

UNIT IV

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

UNIT V

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, "Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2nd Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

RCS305/ RCS405: DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

UNIT IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

UNIT V

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.

3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. AK Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

RCS351: DISCRETE STRUCTURE & LOGIC LAB

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

RCS352: COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

RCS355/RCS455: DATA STRUCTURE USING C/ JAVA LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

REC405: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, “Microprocessors and Interfacing”, Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India.
4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, “IBM PC Assembly language and programming”, Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education.

RCS401: OPERATING SYSTEMS

UNIT I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

UNIT II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer/ Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

UNIT III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

UNIT V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

RCS402: SOFTWARE ENGINEERING

UNIT I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, “Software Engineering”, Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

RCS403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

UNIT I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

UNIT II

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. YN Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya, AK "Theory of Computation and Application", BPaperback Publications
6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication.

7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.
10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.

RCS451: OPERATING SYSTEMS LAB

1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS452: SOFTWARE ENGINEERING LAB

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

RCS453: TAFL Lab

Understanding of software like JFLAP for experimenting with formal languages

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

RCS454: PYTHON LANGUAGE PROGRAMMING LAB

Write a Python program to: -

1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
    a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
    Sample String : 'abc'
    Expected Result : 'abcing'
    Sample String : 'string'
    Expected Result : 'stringly'
    b. To get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
6.
    a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
    b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python
Regular Expressions: re modules, match function, search function, modifiers and patterns
Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.
Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions
File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;
Simple Graphics: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.
Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database.
Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; aggregation and composition.

Reference books:

1. John M. Sewart, "Python for Scientist", Cambridge Universities Press.
2. Reema Thareja, "Python Programming" Oxford Higher Education.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python" Pearson
4. Mrak Litz, " Learning Python",O' Reilly
5. Mark Pilgrim, "Dive into Python", Apress
6. James L. Young, "Python made Simple and Practical", Kindle Edition (paperback)
7. Y. Daniel Liang "Introduction to Programming using Python" Pearson

G. B. Technical University, Lucknow

SYLLABUS

B.Tech THIRD and FOURTH YEAR

(Semester V, VI, VII and VIII)

Computer Science & Engineering
and
Information Technology

Effective from session 2010-11

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	ECS-503	Object Oriented Techniques	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	ECS-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	ECS-553	Object Oriented Techniques Lab*	0-0-2	-	25	25	25	50
10	ECS-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	ECS-602	Software Engineering	3-1-0	30	20	50	100	150
4	ECS-603	Compiler Design	3-1-0	30	20	50	100	150
5	ECS-604	Web Technology	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	ECS-652	Web Technology based Software Engineering Lab*	0-0-2	-	25	25	25	50
9	ECS-653	Compiler Lab*	0-0-2	-	25	25	25	50
10	ECS-654	Seminar	0-0-2	-	50	50	-	50
11	GP-601	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course***.**

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** At least 10 problems are to be considered based on corresponding theory course.***

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note:* ***ECS- 088* *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology
Year-III, Semester-V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	EIT-501	E-Commerce	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	EIT-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	EIT-553	Mini Project using Web Technology -1	0-0-2	-	25	25	25	50
10	EIT-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology
Year-III, Semester-VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	EIT-601	Software Project Management	3-1-0	30	20	50	100	150
4		IT-Elective-I	3-1-0	30	20	50	100	150
5	EIT-602	ERP	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	EIT-652	Software Project Management Lab *	0-0-2	-	25	25	25	50
9	EIT-653	Mini Project using Web Technology -2	0-0-2	-	25	25	25	50
10	EIT-654	Seminar	0-0-2	-	50	50		50
11	GP-601	General Proficiency	-	-	-	-	-	50

Note: *EIT-553 (Mini Project using web technology-1) started in 5th semester has to be continued and completed in 6th semester as EIT-653 (Mini Project using web technology-2)*

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year-IV, Semester-VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	EIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150
3	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
4		IT-Elective-II	3-1-0	30	20	50	100	150
5		IT-Elective-III	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	EIT-751	Cryptography & Network Security Lab*	0-0-2	-	25	25	25	50
7	EIT-752	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
8	EIT-753	Project	0-0-4	-	50	50	-	50
9	EIT-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note: **ECS- 088 may be opted by only those students who didn't opt **EOE-041** as an open elective*

SYLLABUS

(Computer Science & Engineering and Information Technology)

ECS-501: Operating System

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,

TMH
5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

ECS-502: Design and Analysis of Algorithms

Unit-I

Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit -II

Advanced Data Structures*:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.

Unit - III

Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

Unit - IV

Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.

Backtracking, Branch and Bound with examples such as Travelling Salesman Problem,

Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V

Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

ECS-503: Object Oriented Techniques

UNIT I

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT III

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

UNIT IV

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,
Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

UNIT V

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application.
Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

References:

1. James Rumbaugh et. al, "Object Oriented Modeling and Design", PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Mark Priestley "Practical Object-Oriented Design with UML", TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, "Object Oriented Analysis and Design with Applications", Pearson Education
6. Pandey, Tiwari, " Object Oriented Programming with JAVA" , Acme Learning

ECS-504: Computer Graphics

Unit – I

Introduction and Line Generation**:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations**:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces**:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Hidden Lines and Surfaces**:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", TMH

3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. Steven Harrington, "Computer Graphics: A Programming Approach" , TMH
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill

ECS-505: Graph Theory

Unit -I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit -IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem

Discussion of Graph theoretic algorithm wherever required.

References

1. Deo, N, Graph theory with applications to Engineering and Computer Science, PHI
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH
3. Robin J. Wilson, Introduction to Graph Theory, Pearson Education
4. Harary, F, Graph Theory, Narosa
5. Bondy and Murthy: Graph theory and application. Addison Wesley.
6. V. Balakrishnan, Schaum's Outline of Graph Theory, TMH
7. Geir Agnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson Education

EIT-501: E-Commerce

Unit I :

Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit II:

Network Infrastructure for E- Commerce:
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Unit III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit IV

Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit V

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.

EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison- Wesley.
2. Pete Lohsin , John Vacca "Electronic Commerce", New Age International
3. Goel, Ritendra "E-commerce", New Age International
4. Laudon, "E-Commerce: Business, Technology, Society", Pearson Education
5. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
6. Turban, "Electronic Commerce 2004: A Managerial Perspective", Pearson Education

EIT-505 Information Security and Cyber Laws

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services,

Information System Threats and attacks, Classification of Threats and Assessing Damages

Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls,

Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection

Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-IV

Security metrics- Classification and their benefits

Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mIning Security, Building Security into Software Life Cycle

Ethics- Ethical Issues, Issues in Data and Software Privacy

Cyber Crime Types & overview of Cyber Crimes

References :

1. Godbole,“ Information Systems Security”, Willey
2. Merkov, Breithaupt,“ Information Security”, Pearson Education
3. Yadav, “Foundations of Information Technology”, New Age, Delhi
4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill
5. Sood,“Cyber Laws Simplified”, Mc Graw Hill
6. Furnell, “Computer Insecurity”, Springer
7. IT Act 2000

ECS-601: Computer Network

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

References :

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Anuranjan Misra, “Computer Networks”, Acme Learning
5. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS-602: Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design
Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing
Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management
Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

ECS-603: Compiler Design

Unit – I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.
Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis

References:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4.. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

ECS-604 Web Technology

Unit I: Introduction
Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

Unit II: Web Page Designing
HTML: list, table, images, frames, forms, CSS;
XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting
Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; introduction to AJAX, VB Script, CGI

Unit IV: Server Site Programming
Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

References

1. Xavier, C, " Web Technology and Design" , New Age International
2. Deitel, "Java for programmers", Pearson Education
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
4. Ramesh Bangia, "Internet and Web Design" , New Age International
5. Jackson, "Web Technologies" Pearson Education
6. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning

EIT-601: Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

EIT-602: ERP

UNIT - I
ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.
Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation

of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

.

ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.

References:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:
Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,

Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media
5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:
Neurocomputing and Neuroscience
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft
computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley**.**
4. Upadhyaya, "Mobile Computing", Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects

Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks

Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images

Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus for B.Tech. Second Year

Electronics Engineering / Electronics & Communication Engineering / Electronics & Telecommunication Engineering / Electronics & Instrumentation Engineering / Instrumentation & Control Engineering / Applied Electronics & Control Engineering / Biomedical Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REE305	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
4.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
5.	REC302	Electronic Devices and Circuits	3-1-0	70	20	10	100	4
6.	REC303	Signals & Systems	3-0-0	70	20	10	100	3
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	REC352	Electronic Devices and Circuits Lab	0-0-2	50	30	20	100	1
9.	REC353	Signals & Systems Lab	0-0-2	50	30	20	100	1
10.	REC354	Electronics Workshop & PCB Design Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC401	Microprocessors & Microcontrollers	3-0-0	70	20	10	100	3
4.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
5.	REC403	Electronic Measurement & Instrumentation	3-0-0	70	20	10	100	3
6.	RCS406	Data Structure & Algorithms	3-0-0	70	20	10	100	3
7.	REC451	Microprocessors & Microcontrollers Lab	0-0-2	50	30	20	100	1
8.	REC452	Advanced Electronics System Lab	0-0-2	50	30	20	100	1
9.	REC453	Electronic Measurement & Instrumentation Lab	0-0-2	50	30	20	100	1
10.	RCS456	Data Structure & Algorithms Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REE305: NETWORK ANALYSIS & SYNTHESIS

UNIT I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

UNIT II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

UNIT III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

UNIT IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

UNIT V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. MS Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. ME Van Valkenberg, "Network Analysis", Prentice Hall of India Ltd.
2. Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning Pvt. Ltd

REC301: DIGITAL LOGIC DESIGN

UNIT I

Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

UNIT II

Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III

Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

UNIT V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

REC302: ELECTRONIC DEVICES AND CIRCUITS

UNIT I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

UNIT III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. AS Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, “Electronic Devices and Circuits”, Tata McGraw Hill.
3. BG Streetman and S. Banerjee “Solid State Electronics Devices”, Prentice Hall of India.

Reference Books:

1. Donald A. Neamen “Semiconductor Physics & Devices”, Tata McGraw Hill.
2. Alok K. Dutta, “Semiconductor Devices and Circuits”, Oxford University Press.
3. Jacob Millman and Arvin Grabel, “Microelectronics”, Tata McGraw Hill.

REC303: SIGNALS & SYSTEMS

UNIT I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

UNIT II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems.

UNIT III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

UNIT IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

UNIT V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Book:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals and Systems', Pearson Education.
2. TK Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. BP Lathi, "Principals of Linear Systems and Signals", Oxford University Press.
2. P. Ramakrishna Rao, 'Signal and System', Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, "Probability & Statistics with Reliability Queuing and Computer Science Applications", Wiley Publication.

REC351: DIGITAL LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

REC352: ELECTRONIC DEVICES AND CIRCUITS LAB

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

REC353: SIGNALS & SYSTEMS LAB

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two- and three-dimensional plots.
    b. Write a MATLAB program to plot the following Continuous time and discrete time signals
        1. Step Function
        2. Impulse Function
        3. Exponential Function
        4. Ramp Function
        5. Sine Function
3. Time and Amplitude transformations
    a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
    a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier Series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier Series as a function of time
    c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier Transform of a given signal
    b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
    b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

REC354: ELECTRONICS WORKSHOP & PCB DESIGN LAB

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

RCS406: DATA STRUCTURE & ALGORITHMS

UNIT I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

UNIT III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element, Trees and their applications: C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

UNIT IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

UNIT V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Book:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Reema Theraja, “Data Structure using C”, OUP Publication.

References Books:

1. E. Balagurusamy, “Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. TH Koreman, “Introduction to Algorithms“, MIT Press.

REC401: MICROPROCESSORS & MICROCONTROLLERS

UNIT I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts, Programming using interrupts, Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming.

UNIT III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption.

UNIT IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning.
Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: "A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID.

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publication (India) Pvt. Ltd.
2. DV Hall, "Microprocessors Interfacing", Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880

5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. AK Roy & KM Bhurchandi, “Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)”, Tata McGraw Hill Publication.

REC402: ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate Systems and Transformation :

Basics of Vectors: Addition, subtraction and multiplications**;** Cartesian, Cylindrical, Spherical transformation.

Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form
Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

REC403: ELECTRONIC MEASUREMENT AND INSTRUMENTATION

UNIT I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.

PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

UNIT II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System.

UNIT III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

UNIT IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

UNIT V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers.

Text Book:

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, Tata McGraw Hill Publication.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann).

REC451: MICROPROCESSORS AND MICROCONTROLLERS LAB

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately

   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.

   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.

   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:

   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

   Exercises:

   a) How many Low power modes are supported by the MSP430G2553 platform?

   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises:

   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.

Exercises:

a) Alter the threshold to 75% of Vcc for the LED to turn on.

b) Modify the code to change the Reference Voltage from Vcc to 2.5V.

8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

   Exercises:

   a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?
   b) Create a PWM signal of 75% duty cycle on particular PWM pin.
   c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

   Exercises:

   a) How does the ULP Advisor software help in designing power-optimized code?
   b) Which ULP rule violation helps us to detect a loop counting violation?
   c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

    Exercise:

    Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

    char str1[]="MSP430G2 launchpad"

    char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

    Exercises:

    a) Which port pins of MSP430 can be configured for SPI communication?

    b) What is the data transfer rate supported by MSP430 for SPI communication?

REC452: ADVANCED ELECTRONICS SYSTEM LAB

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
    - *DC biasing of Common Source
    - *MOSFET Common Source Amplifier
    - *MOSFET Source Follower
    - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

- -MOSFET based Ring oscillators
- -MOSFET based Relaxation oscillators
- MOSFET based Voltage-controlled oscillators
- Integration of crystal oscillator into circuits

Data Conversion

- Analog to Digital Conversion
    - * Successive Approximation ADC
- Digital to Analog Conversion
    - * Scaled Resistor Network

System Considerations

- System-level stability: decoupling, ground loops
- Basics of EMC and screening
- Examples of complete electronic systems

REC453: ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

RCS456: DATA STRUCTURE AND ALGORITHMS LAB

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
   a. Searching (Linear Search, Binary Search)
   b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
   c. Merging
4. Implementation of Link List
   a. Creation of Singly link list, Doubly Linked list
   b. Concatenation of Link list
   c. Insertion and Deletion of node in link list
   d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
   a. Array
   b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
   a. Depth First Search
   b. Breadth First Search
   c. Prim`s Algorithm
   d. Kruskal`s Algorithms
9. Implementation of Hash Table

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW

Syllabus

3rd Year

[Effective from Session 2016-17]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering

SEMESTER-V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501R	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System -I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551R	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab - 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

CT Class Test **AT** Attendance **TA** Tutorial Assignment
ESE End Semester Examination
L/T/P Lecture/ Tutorial/ Practical

SEMESTER-VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC0_	Departmental Elective -I	3	1	0	30	20	50	100	150	4
5	NEC0_	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab - II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654R	Seminar	0	0	1	10	10	20	-	20	1
11	NEC 655	Microcontrollers for Embedded Systems Lab	0	0	1	6	6	12	18	30	1
12	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	26

Departmental Elective –I

1. NEC011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices
5. NEC013R Real Time Systems

Departmental Elective - II

1. NEC 021 Industrial Electronics
2. NEC 022R Microcontroller for Embedded Systems
3. NEC 023 Analog Signal Processing
4. NEC 024R Advance Digital Design using Verilog

NEC 501R Integrated Circuits		
Unit	Topic	Number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press.
2. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, 2nd Edition.

Reference Books:

1. Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Edition, Tata McGraw Hill.
2. Behzad Razavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley.
3. Mark N. Horenstein, "Microelectronic Circuits and Devices", PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf

6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

NEC 502 Principles of Communication		
Unit	**Topic**	**Lectures**
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Needformodulation,Baseband and Pass band signals, Amplitude Modulation: Double side bandwidth Carrier(DSB-C),Double side band without Carrier, Single Side Band Modulation, DSB-SC,DSB-C,SSB Modulators and Demodulators, Vestigial Side Band (VSB),Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	8
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM),PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-Emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops: Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill Publication.

Reference Books:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.Hsu &D.Mitra,"Analog and Digital Communications", Tata McGraw-Hill Publication.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	**8**
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	**8**
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	**8**
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	**8**
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupts controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	**8**

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085",Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill Publication.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer Publication.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson Publication.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill Publication.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson Publication.

NIC 501 Control System -I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
in	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", John Wiley India Publication.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Feedback and Control Systems" Schaums Outlines Series, Tata McGraw Hill Publication.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	**Topic**	**Lectures**
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) QA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	**8**
II	**Point Sources and Their Arrays:** Introduction, Point Source, Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures:** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of *λ/2* Antenna, Array of Two Driven *λ/2* Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	**8**
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	**8**
IV	**Ground Wave Propagation: Plane** Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation: Introduction,** Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics.	**8**

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", Tata McGraw Hill Publication.

Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propogation", Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI Publication.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill Publication.

LABOROTARY

NEC 551R INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for –
    a. Low pass filter of specified cutoff frequency
    b. High pass filter of specified frequency
    c. Band pass filter with unit gain of specified pass band
    d. Design a notch filter to eliminate 50Hz power line frequency
4. Wien bridge oscillator using operational amplifier.
5. Astable and monostable multivibrator using IC 555.
6. Design the following amplifiers:
    a. A unity gain amplifier
    b. A non-inverting amplifier with a gain of 'A'
    c. An inverting amplifier with a gain of 'A'
    d. Log and antilog amplifiers.
    e. Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency 'f'. Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

NIC 551: Control System Lab

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plot unit step response and to find rise time and delay time.
7. Plot locus of given transfer function, locate closed loop poles for different values of k.
8. Plot root locus of given transfer function and to find out S, Wd, Want given root & to discuss stability.
9. Plot Bode plot of given transfer function.
10. Plot Bode plot of given transfer function and find gain and phase margins
11. Plot Nyquist plot for given transfer function and to compare the irrelative stability
12. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain

and phase margin.

Note:-In addition to it, Institutes may include more experiments based on the expertise.

NEC 552: Communication Lab - 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
   a. using switching method
   b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-Uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	**Topic**	**Lectures**
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Microstrip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	**8**
II	Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. Spara meter analysis of all components.	**8**
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	**8**
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit -time devices: IMP ATT Diode, TRAPPAT Diode.	**8**
V	Microwave Measurements: General setup of a microwave testbench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	**8**

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson Education Publication.

Reference Books:

1. R.E Collin, "Foundation for Microwave Engineering", John Wiley India Publication
2. A. Das and S.K. Das," Microwave Engineering", Tata McGraw Hill Publication.

NEC 602 Digital Communication		
Unit	**Topic**	**Lectures**
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques.(QPSK and MSK),M-ary Digital carrier Modulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes.	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	8
IV	Spread Spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	8
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memoryless channel Error Correcting codes: Hamming sphere, Hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	8

Text Book:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press Publication.

Reference Books:

1. H. Taub, D.L. Schilling, G. Saha,"Principles of Communications", McGraw-Hill International Publication.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.HSU and D.Mitra,"Analog and Digital Communications", TataMcGraw-Hill Publication.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor -Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, "VLSI Technology", McGraw Hill Publication.
2. S.K. Ghandhi, "VLSI Fabrication Principles", Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, Practice and Modelling", Pearson Education Publication.
2. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press.

Laboratory

NEC 651 ANTENNA AND MICROWAVE LAB

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator.
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anti-Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient & DC Analysis of NOR Gate inverter.

5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

NEC 655 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

Electives Subjects

NEC 011 Digital Signal Processing		
Unit	**Topic**	**Lectures**
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters:** Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation -In Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, "Digital Signal Processing", PHI Publication.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI Publication.
3. Sanjit K. Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill Publication.
4. Monson Hayes, "Digital Signal Processing", McGraw Hill Education Publication.

NEC 012 Computer Architecture and Organization		
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8

III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.

NEC 013 Artificial Neural Network		
Unit	**Topic**	**Lectures**
I	**Introduction to ANN** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture.	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8

IV	**a)Feedforward neural networks** - - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran , Vijayalakshmi Pari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

NEC-013R REAL TIME SYSTEMS		
Unit	**Topic**	**Lectures**
I	**Introduction to Real Time System** Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8

II	**Embedded Hardware for Real Time System** Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware – On chip Peripherals and Communication protocols** Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART. **Introduction to the CCS IDE:** its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. **Programming:** demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.

3. Hamid A. Toliyat and Steven G. Campbell, "DSP based Electromechanical Motion Control" CRC Press Publication.
4. Jean J Labrosse, "Embedded System Design blocks", CMP books Publication
5. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication.

NEC 014 Advance Semiconductor Devices		
Unit	**Topic**	**Lectures**
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator - Semiconductor Capacitors.	**8**
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	**8**
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	**8**
IV	Transferred-Electron and Real-Space-Transfer Devices Thyristors and Power Devices **Photonic Devices and Sensors:** Radioative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	**8**
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. Sensors: Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	**8**

Text Book:

1. S. M. Sze, Kwok K. NG, "Physics of Semiconductor Devices", Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	**Topic**	**Lectures**
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor -Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	**8**
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	**8**
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	**8**
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	**8**

Text Books:

1. M. H. Rashid, "Power Electronics", Pearson Education Publication.

Reference Books:

1. M. D. Singh & K. Khanchandani, "Power Electronics", Tata McGraw Hill Publication.
2. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press,
3. M.S. Jamil Asghar, "Power Electronics", PHI Publication.

NEC 022R Microcontrollers for Embedded Systems		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers.	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	8
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and Mc Kinlay Rolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide..

NEC 023 Analog Signal Processing		
Unit	**Topic**	**Lectures**
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: null or, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω0), frequency response, effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R. Schaumann and M.E. Valkenberg," Design of Analog Circuits", Oxford University

NEC 024R Advanced Digital System Design using Verilog		
Unit	**Topic**	**Lectures**
I	**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools. **Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.	8
II	**Gate Level Modeling:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits. **Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.	8

III	**Behavioral Modeling:** Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow if and if-else constructs, Assign-De-Assign construct, Repeat construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event. **Switch Level Modeling:** Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.	8
IV	**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives. **Sequential Circuit Description:** Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.	8
V	**Components Test and Verification:** Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification. Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems.	8

Text Books:

1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL", Wiley Publication.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH Publication.
3. Richard F. Tinder, "Engineering Digital Design", Academic Press Publication.

Reference Books:

1. Stephen. Brown and Zvonko Vranesic," Fundamentals of Logic Design with Verilog Design", TMH Publication.
2. Sunggu Lee ,"Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA ", Cengage Learning Publication.
3. Samir Palnitkar , "Verilog HDL", 2nd Edition, Pearson Education Publication.
4. Michael D. Ciletti , "Advanced Digital Design with Verilog HDL ", PHI Publication.
5. Parag K. Lala, "Digital System Design Using PLDs", PHI India Ltd.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins," Carrier-Grade VoIP", McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, "IP Telephony – Deploying Voice Over-IP Protocols", John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

NEC 041 ELECTRONIC SWITCHING		3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication Switching Systems and Networks", PHI.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

Dr.A.P.J.Abdul
kalam Technical University,UttarPardesh,Lucknow
(Formerly Uttar Pradesh Technical University)
STUDY EVALUATION SCHEME
INFORMATION TECHNOLOGY
YEAR forth, SEMESTER –VII
(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NIT-751	Cryptography & Network Security*	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdulkalam Technical University,UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
INFORMATION TECHNOLOGY
YEAR forth, SEMESTER –VIII
(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NIT-801	Mobile Computing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practicals / Training /Projects									
5	NIT-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

***** *At least 10 problems are to be considered based on corresponding theory course.*

Open Elective I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Bio Technology
NOE-075 Mobile Application Development
NOE-076 Ethical Hacking and Prevention
NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NIT-071 IT in Forensic Science

Departmental Elective IV

1. NCS-074 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NCS-701 Distributed System
5. NCS-073 Computer Vision

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-082 Real Time System
3. NCS-084 Grid Computing
4. NCS-801 Digital Image Processing
5. NIT-080 Natural Language Processing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-087 Embedded Systems
3. NCS-088 Semantic Web and Web Services
4. NIT-081 Software Quality Engineering
5. NIT-082 Software Reliability

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 **L T P**
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5
Government policy for small scale industry; stages in starting a small scale industry. 2
UNIT -II
Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8
UNIT -III
Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9
UNIT -IV
Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9
U NIT -V
Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5
Role of various national and state agencies which render assistance to small scale industries. 2
Text / Reference Books:
1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. 5
UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. 2
UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5
UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. 8
UNIT –V
ISO-9000 and its concept of Quality Management
7
ISO 9000 series, Taguchi method, JIT in some details.
Text / Reference Books:
1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.
UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.
UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.
UNIT-IV
Theory of Games :
Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poisson queuing model, single server models.
UNIT-V Inventory
Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:
1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 **L T P**

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P
3 1 0

UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:
1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077

L	T	P
3	1	0

UNIT-I:

Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:

Project Organization and Scheduling 10

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:

Project Monitoring and Control10

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:

Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:

Project Management and Project Management Tools10

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.
Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,
Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)
Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Authentication Applications:
Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.
Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

Text Books:

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
5. Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
6. AtulKahate, “Cryptography and Network Security”, Tata McGraw Hill

ARTIFICIAL INTELLIGENCE

NCS-702 **L T P**
3 1 0

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering:**10**

Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

Verification:

Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II

Functional Testing::**10**

Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing:

Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

Unit-III

Regression Testing::**10**

What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

Reducing the number of test cases:

Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV:**10**

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing

Automated Test Data Generation:

Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V:**5**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

Text Books:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K.K. Aggarwal&Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, "Software System Testing and Quality Assurance", Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

IT IN FORENSIC SCIENCE

NIT-071 **L T P**
3 1 0

UNIT I 8

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security. Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans. Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II 8

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III 8

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques. Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV 12

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system. Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V 8

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

TOTAL LECTURE: 44

Text Books:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media 5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture ,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiand WiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet SwitchingNetworks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV 8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.

Text Books:

1. William Stallings, "High speed networks and internet", Second Edition, Pearson Education, 2002
2. Warland, Pravin Varaiya, "High performance communication networks", Second Edition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

Text Books:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076

L	T	P
3	1	0

UNIT I **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

Text Books:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, andDesign",Pearson Education, 2005.
2. Newcomer, Lomow"Understanding SOA with Web Services", Pearson Education, 2005.
3. SandeepChatterjee, James Webber, "Developing Enterprise Web Services, AnArchitect's Guide", Pearson Education, 2005.
4. Dan Woods and Thomas Mattern," Enterprise SOA Designing IT for BusinessInnovation" O'REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

DISTRIBUTED SYSTEMS

NCS-701 **L T P**

3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks,Lamport's& vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

Text Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

CRYPTOGRAPHY AND NETWORK SECURITY LAB

NIT-751	**L**	**T**	**P**
	0	**0**	**2**

The following programs should be implemented preferably on 'UNIX' platform using 'C' language (for 1-5) and other standard utilities available with 'UNIX' systems (for 6-8) :-

1. Implement the encryption and decryption of 8-bit data using 'Simplified DES Algorithm'
2. (created by Prof. Edward Schaefer) in 'C'.
3. Implement 'Linear Congruential Algorithm' to generate 5 pseudo-random numbers in'C'.
4. Implement Rabin-Miller Primality Testing Algorithm in 'C'.
5. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.
6. Implement RSA algorithm for encryption and decryption in 'C'
7. Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.
8. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.
9. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:

(a) Two neighborhood IP addresses on your LAN
(b) All ICMP requests

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 L T P
3 1 0

UNIT-I
Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4
UNIT-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9
UNIT-III Geothermal
Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations. 2
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations. 3
UNIT-IV
Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations. 2
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6
UNIT-V
Bio-mass:
Availability of bio-mass and its conversion theory. 2
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants. 3
Text/References Books:
1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International. 5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI
Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 L T P
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. 8
UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7
UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. 8
UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8
UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9
Reference Books:
1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 L T P
3 1 0

UNIT-1
Concept of Product, definition and scope.
Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.
UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
UNIT –III
Transformations, Brainstorming& Synetics, Morephological techniques.
Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.
Economic aspects, Fixed and variable costs, Break-even analysis.
UNIT-IV
Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.
UNIT-V
Existing techniques, such as work-study, SQC etc. for improving method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.
Text/Reference Books:
3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 L T P
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.
Text/Reference Books:
1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automat (c)All TCP SYN Packets

MOBILE COMPUTING

NIT-801 **L T P**
3 1 0

Unit – I **8**
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit – II **12**
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III **8**
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit – IV **8**
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V **8**
Ad-hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

TOTAL: 44 PERIODS

Text Books:

1. Thampi - Mobile Communications and Computing ,Wiley
2. J. Schiller, Mobile Communications, Addison Wesley.
3. Charles Perkins, Mobile IP, Addison Wesley.
4. Charles Perkins, Ad hoc Networks, Addison Wesley.
5. Upadhyaya, "Mobile Computing", Springer
6. Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India.

PATTERN RECOGNITION

NCS-080	L	T	P
	3	1	0

Unit-I

Introduction: 8
Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: 8
Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods:12
Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques:8
Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: 8
Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

Text Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.
4. Pattern Recognition,Narasimha Murty,Universities Press.
5. Pattern Recognition and Image Analysis,Gose, Johnsonbaugh & Jost,PHI Learning.
6. PATTERN RECOGNITION: TECHNIQUES AND APPLICATIONS,SHINGHAL,OXFORD UNIVERSITY PRESS.

REAL TIME SYSTEM

NCS-082 **L T P**
3 1 0

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

Text Books:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.
5. KRISHNA, Real-Time Systems, Mc Graw Hills

GRID COMPUTING

NCS-084	L	T	P
	3	1	0

UNIT I

CONCEPTS AND ARCHITECTURE **10**

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II

GRID MONITORING **10**

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III

GRID SECURITY AND RESOURCE MANAGEMENT **10**

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV

DATA MANAGEMENT AND GRID PORTALS **10**

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V

GRID MIDDLEWARE **5**

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

Text Books:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.
5. Joshy Joseph, Craig Fellenstein, Grid Computing, Pearson Education.
6. Grid Computing Security, Anirban Chakrabarti, Springer, 2007.

Digital Image Processing

NCS-801

L	T	P
3	1	0

UNIT-I

Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

Text Books:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

Natural Language Processing

NIT-080	**L**	**T**	**P**
	3	**1**	**0**

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

DATA COMPRESSION

NCS-085

L	T	P
3	1	0

Unit - I: **10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: **10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: **10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

Text Books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,Khalid Sayood, The Morgan aufmann Series
4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. T ext Compression1st Edition by Timothy C. Bell Prentice Hall.

EMBEDDED SYSTEMS

NCS-087	**L**	**T**	**P**
	3	1	0

Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. H.Kopetz, "Real-Time Systems", Kluwer
3. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
4. Shibu K.V., "Introduction to Embedded Systems", TMH
5. Marwedel, "Embedded System Design", Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088 **L T P**

3 1 0

UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

SOFTWARE QUALITY ENGINEERING

NIT-081	L	T	P
	3	1	0

UNIT-I:

Introduction **8**

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II:

Software Quality Metrics **8**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III:

Software Quality Management and Models **8**

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV:

Software Quality Assurance **12**

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V:

Software Verification, Validation & Testing: **8**

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

TOTAL: 44 PERIODS

Text Books

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley
3. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
4. Royce, Software Project Management, Pearson Education
5. Kieron Conway, Software Project Management, Dreamtech Press
6. S. A. Kelkar, Software Project Management, PHI Publication.

SOFTWARE RELIABILITY

NIT-082 **L T P**
3 1 0

UNIT-I:
Introduction **8**

Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II:
Software Reliability Metrics **8**

Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III:
Software Reliability Assessment Models **8**

Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV:
Software Reliability Allocation Models **8**

Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V:
Software Reliability Techniques **12**

Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

TOTAL: 44 PERIODS

Text Books

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

L T P
0 0 2

List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

L T P
3 1 0

Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

L T P
3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

L T P
3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print ‘A’
80-90%----------Print ‘B’
60-80%----------Print ‘C’
Below 60%----------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus
For
B.Tech. Second Year
(Mechanical Engineering/ Production Engineering, Industrial & Production Engineering, Mechanical & Industrial Engineering, Manufacturing Technology, Automobile Engineering, Aeronautical Engineering)
On
Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	Th/Lab ESE	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE031 to 036, 038, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
4.	RME301	Material Science	3-0-0	70	20	10	100	3
5.	RME302	Thermodynamics	3-1-0	70	20	10	100	4
6.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
7.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
8.	RME351	Material Science & Testing Lab	0-0-2	50	30	20	100	1
9.	RME352	Thermodynamics Lab	0-0-2	50	30	20	100	1
10.	RME353	Computer Aided Machine Drawing–I Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE041 to 046, 048, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REE409	Electrical Machines & Controls	3-0-0	70	20	10	100	3
4.	RME401	Measurement and Metrology	3-0-0	70	20	10	100	3
5.	RME402	Manufacturing Science & Technology-I	3-0-0	70	20	10	100	3
6.	RME403	Applied Thermodynamics	3-1-0	70	20	10	100	4
7.	REE459	Electrical Machines and Controls Lab	0-0-2	50	30	20	100	1
8.	RME451	Measurement and Metrology Lab	0-0-2	50	30	20	100	1
9.	RME452	Manufacturing Science & Technology–I Lab	0-0-2	50	30	20	100	1
10.	RME453	Computer Aided Machine Drawing-II Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

NOTE: Practical summer training-1 of 4-weeks after IV semester or Minor fabrication project will be evaluated in VII semester.

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

RME301: MATERIAL SCIENCE

UNIT I

Introduction: Importance of materials, historical perspective, Future aspects of engg. materials.

Crystal Structure: brief on BCC, FCC and HCP Structures, coordination number and atomic packing factors. Bravais lattices, Miller indices, crystal imperfections-point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

Ferrous and non- ferrous materials: Properties, Composition and uses of Grey cast iron, malleable iron, SG iron and steel, copper alloys-brasses and bronzes, Aluminium alloys. Introduction to BIS & ASTM codes and practice on material and testing.

UNIT II

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, mechanical properties in plastic range, yield strength off set yield strength, ductility, ultimate tensile strength, toughness, Plastic deformation of single crystal by slip and twinning, Hardness Tests.

Fracture Creep Fatigue: Fracture: Type I, Type II and Type III. Creep: Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation. Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

UNIT III

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures. Phase Diagram I: Solid solutions Hume Rothary rule, substitutional and interstitial solid solutions, intermediate phases, Gibbs phase rule.

Phase Diagram: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

UNIT IV

Heat Treating of Metals: TTT curves, continuous cooling curves, annealing and its types. Normalizing, hardening, tempering, mastempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

Comparative study of microstructure of various Ferrous, nonferrous metals and alloys.

UNIT V

Composite materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

Ceramics: Structure types and properties and applications of ceramics. Mechanical/ Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/ plastics and its applications. Mechanical behaviour and processing of plastics, Future of plastics. Introduction to Smart materials & Nano-materials and their potential applications.

Books and References:

1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.

2. Elements of Material Science & Engineering by Van Vlack, Pearson
3. Material Science and Engineering by Smith, Hashemi and Prakash, MCGRAW HILL INDIA
4. The Science and Engineering of materials, by Askeland & Balani, Cengage Learning
5. Introduction to Materials Science for Engineers by Shackelford, Pearson
6. Material Science by Narula, MCGRAW HILL INDIA.
7. Materials Science and Engineering - A First Course by Raghavan, PHI
8. Material Science and Engineering Properties by Gilmore, Cengage Learning
9. Material Science for Engineering Students by Fischer, Academic Press
10. Technology of Engineering materials by Philip and Bolton, Butterworth-Heinamann

RME302: THERMODYNAMICS

UNIT I

Review of Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases. **Zeroth law of thermodynamics:** Concept of Temperature and its' measurement, Temperature scales.

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

UNIT II

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Mollier chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

Air-water vapour mixture and Psychrometry: Psychometric terms and their definitions, Psychometric chart, Different Psychometric processes and their representation on Psychometric chart.

UNIT V

Refrigeration Cycles: Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration.Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system.

Books and References:

1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.
6. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
7. Engineering Thermodynamics by Dhar, Elsevier.
8. Engineering Thermodynamics by Onkar Singh, New Age International.
9. Engineering Thermodynamics by CP Arora.
10. Engineering Thermodynamics by Rogers, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Engineering Thermodynamics by Mishra, Cengage Learning
13. Refrigeration and Air Conditioning by C P Arora, MCGRAW HILL INDIA

RME303: MECHANICS OF SOLIDS

UNIT I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure. Thermal Stresses.

UNIT II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams
Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

UNIT III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.
Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

UNIT IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.
Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

UNIT V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.
Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Yσungs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Material by Rattan, MCGRAW HILL INDIA
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

RME351: MATERIALS SCIENCE AND TESTING LAB

In this lab Experiments on Material Science and Experiments on Material Testing are to be conducted as given below:

(A). Experiments on Material Science (at least 5 of the following):

1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & micro examination of the welded specimen.
10. Study of Magnetic/ Electrical/Electronic materials.

(B) Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

RME352: THERMODYNAMICS LAB

Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance sheet for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment(s) on thermodynamics

RME353: COMPUTER AIDED MACHINE DRAWING-I LAB

Introduction (1 drawing sheets)
Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

Orthographic Projections (3 drawing sheets)
Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

Fasteners (2 drawing sheets)
Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

Riveted joints (1 drawing sheet)
Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

Assembly drawing (2 drawing sheets)
Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

Free hand sketching (1 drawing sheet**)**
Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

Computer aided drafting (1 drawing**)**
Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

REE409: ELECTRICAL MACHINES & CONTROLS

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests. **Three Phase Transformer:** Three phase transformer connections, 3-phase to 2-phase or 6-phase connections and their applications. **Auto Transformer:** Volt- Amp relations, efficiency, advantages & disadvantages, applications. **D.C. Motors:** Concept of starting, speed control, losses and efficiency.

UNIT II

Three phase Induction Motor: Construction, equivalent circuit, torque equation and torque-slip characteristics, speed control. **Alternator:** Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. **Synchronous Motor:** Starting, effect of excitation on line current (V-curves), synchronous condenser. **Servo Motor:** Two phase A.C. servo motor & its application.

UNIT III

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, electrical analog of simple mechanical systems; concept of transfer function & its determination for simple systems. **Control System:** Open loop & closed loop controls, servo mechanisms; concept of various types of system. **Signals:** Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics**.**

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants. **Stability:** Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations; Polar plot, Nyquist stability Criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. **Frequency Response Analysis:** Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots. **Process control:** Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text and Reference Books:

1. IJ Nagrath & D. P. Kothari, “Electrical machines” Tata McGraw Hill.
2. BR Gupta & Vandana Singhal, “Fundamentals of Electrical Machines”, New Age International.
3. K. Ogata, “Modern Control Engineering” Prentice Hall of India.
4. BC Kuo, “Automatic Control systems.” Wiley India Ltd.
5. Irvin L. Kosow, “Electric Machinery and Transformers” Prentice Hall of India.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, Control Systems: Principles and Design” Tata McGraw Hill.

RME401: MEASUREMENT AND METROLOGY

UNIT I

Mechanical Measurements: Introduction to measurement and measuring instruments. General concept–Generalized measurement system and its elements-Unit sand standards-measuring instruments: sensitivity, stability, range, accuracy and precision-static and dynamic response- repeatability-systematic, Source of error, statistical analysis of error and random errors- correction, calibration. Dimensional and geometric tolerance

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

UNIT II

Time Related Measurements: Stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

UNIT III

Flow Measurement: Hot Wire Anemometry, Laser Doppler Velocimetry, Rotameter

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Measurements of Force, Torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments

Measurements of Acceleration, and Vibration: Accelerometers vibration pickups and decibel meters, vibrometers.

UNIT IV

Coordinate measuring machine (CMM): Need, constructional features and types,

Metrology and Inspection: Standards of linear measurement, line and end standards. Interchange ability and standardization. Linear and angular measurements devices and systems **Comparators:** Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design.

UNIT-V

Limits, Fits &Tolerance and Surface roughness: Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness. Measurement of geometric forms like straightness, flatness, roundness. Tool makers microscope, profile projector, autocollimator.

Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:

1. Experimental Methods for Engineers by Holman, MCGRAW HILL INDIA
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, MCGRAW HILL INDIA
5. Measurement Systems, Application Design by Doeblein, MCGRAW HILL INDIA
6. Hume KJ, "Engineering Metrology", MacDonald and Co
7. Jain, RK, "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers
9. Gupta SC, Engineering Metrology, Dhanpat Rai Publications

RME402: MANUFACTURING SCIENCE & TECHNOLOGY-I

UNIT I

Introduction: Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items. **Metal Forming Processes**: Elastic & plastic deformation, yield criteria (Mises' and Tresca's). Hot working versus cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.

UNIT II

Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. Design, lubrication and defects in metal forming processes.

UNIT III

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load (capacity) needed. Analysis of forming process like cup/deep drawing. Bending & spring-back.

UNIT IV

Casting (Foundry): Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting, Sand casting, defects & remedies and inspection. Cupola furnace. Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO_2 casting and Stir casting etc.

UNIT V

Unconventional Metal forming processes: Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming. **Powder Metallurgy**: Introduction to Powder metallurgy manufacturing process. Application and, advantages. **Jigs & Fixtures**: Locating & Clamping devices & principles. Jigs and Fixtures and its applications. **Manufacturing of Plastic components**: Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by PC Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA
5. Manufacturing Processes by Lindberg, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson
7. Materials and Manufacturing by Paul Degarmo.
8. Manufacturing Processes by Kaushish, PHI
9. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
10. Production Technology by RK Jain

EME403: APPLIED THERMODYNAMICS

UNIT I

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

UNIT II

Vapour Power cycles: Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, MCGRAW HILL INDIA
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI
5. Theory of Stream Turbine by WJ Kearton

6. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Steam & Gas Turbine by R. Yadav, CPH Allahabad
9. Thermodynamics and Energy Systems Analysis, Borel and Favrat, CRC Press
10. Thermodynamics by Prasanna Kumar, Pearson
11. Thermal Engineering by Kulshrestha, Vikas Publishing.
12. Thermal Engg. By PL Ballaney, Khanna Publisher
13. Thermal Engg. By RK Rajput, Laxmi Publication

REE459: ELECTRICAL MACHINES & CONTROLS LAB

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Control Systems

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To obtain 3-phase to 2-phase conversion using Scott connection.
7. To perform load test on a 3-phase induction motor and determine (a) speed- torque characteristics (b) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Control Systems:

1. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an a.c. 2-phase servo motor.
4. To study and calibrate temperature using Resistance Temperature Detector(RTD)
5. To study dc servo position control system within P and PI configurations.
6. To study synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

RME451:MEASUREMENT & METROLOGY LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sine bar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. Experiment on measurement of pressure.
11. Study of temperature measuring equipments.
12. Measurement using Strain gauge.
13. Measurement of speed using stroboscope.
14. Experiment on measurement of flow.
15. Measurement of vibration/power.
16. Experiment on dynamometers.
17 To study the displacement using LVDT.

RME452 :MANUFACTURING TECHNOLOGY-I LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

RME453: COMPUTER AIDED MACHINE DRAWING-II LAB

Note: All drawing conform to BIS Codes.

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts. List of Standard Abbreviation used.

Part Modeling: Introduction to part modeling of simple machine components using any 3D software (like CATIA, PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model ***(Minimum 24 machine components need to be developed).***

Part Modeling & Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing by K.R. Gopalakrishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria & Sons
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age publications
5. Engineering Graphics with AutoCAD, Bethune, PHI
6. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley

U.P. TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

3rd Year

[Effective from session 2015-16]

1. B. Tech. Mechanical Engineering
2. B. Tech. Production Engineering
3. B. Tech. Industrial & Production Engineering
4. B. Tech. Mechanical & Industrial Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NME-505	I.C. Engines & Compressors	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NME-604	Refrigeration & Air-conditioning	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-014	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NME-654	Refrigeration & Air Conditioning Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NPI-501	Production Planning & Control	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20015-16]

YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NPI-601	Principles of Machine Tool Design	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-015	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NPI-651	Machine Tool Design Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency						50		50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

NME-501 : MACHINE DESIGN-I **L T P**
2 1 0

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

3

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

4

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

4

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

4

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

4

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

4

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

4

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

3

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion

6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-502 : KINEMATICS OF MACHINES **L:T:P**
3: 1: 0

Unit I

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

4

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, rubbing velocity at a pin joint, instantaneous center method, types and locations of instantaneous center, Kennedy's theorem, velocities in four bar mechanism and slider crank mechanism.

4

Unit II

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism, Klein's construction for slider crank mechanism and four bar mechanism, analytical method for slider crank mechanism.

4

Kinematic synthesis of mechanism:

Introduction, dimensional synthesis of mechanisms, motion, path and function generation, Chebyshev spacing, three position synthesis, graphical approach for four link mechanisms, straight line mechanisms, special mechanisms – indicator diagram mechanisms, steering mechanisms, Hook's Joint

4

Unit III

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration, simple harmonic and cycloidal motions of follower. Analytical methods for cam profile.

8

Unit IV

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, interference and undercutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

8

Unit V

Friction drives

Introduction, belt and rope drives, open and crossed belt drives, velocity ratio, slip, power transmission, effect of mass of belt on power transmission, maximum power transmission, initial tension and maximum tension, pivots and collars, uniform pressure and uniform wear, clutches.

8

Books:

1. Theory of Mechanisms and Machines: A Ghose and A K Malik, East West Press Pvt Ltd.
2. Theory of Mechanisms and Machines: J JUicker, G R Pennock and J E Shigley, Oxford University Press.
3. Kinematics and dynamics of machinery: C E Wilson and J E Sadler: PEARSON
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Machines: S S Rattan, McGraw Hill
6. Theory of Machines: Thomas Bevan, Pearson

NME-503: MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 1 0

Unit I

Metal Cutting-

Mechanics of metal cutting.Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants.Tool materials. Tool wear and tool life. Machinability.Dynamometer, Brief introduction to machine tool vibration and surface finish.Economics of metal cutting.

9

Unit-II

Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III

Grinding &Super finishing

(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:

Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV

B. Metal Joining (Welding)

Survey of welding and allied processes.Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters.Resistance welding - spot, seam projection etc.Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds and

remedies. Weld decay in HAZ.

10

Unit-V

C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.
4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

NME-504 : HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1

Introduction to Heat Transfer:

Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :

General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :

Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

5

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

NME-505 : I C ENGINES & COMPRESSORS **L T P**

3 1 0

Unit-1

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.

Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles

Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III

CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings

Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

NPI-501: PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.

7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

NME-551 : MACHINE DESIGN-I Lab **L T P**

0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

NME-553 : MANUFACTURING TECHNOLOGY -II – LAB **L T P**

0 0 3

Minimum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints.

NME-554 : HEAT & MASS TRANSFER – LAB **L T P**

0 0 3

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment
14. Heat exchanger - Counter flow experiment

NME-602: MACHINE DESIGN-II **L T P**

3 1 0

UNIT I

Principle of transmission and conjugate action

Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears

Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

6

UNIT II

Bevel gears

Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-603 : DYNAMICS OF MACHINES **L T P**
3 1 0

Unit I

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

7

Unit II

Gyroscope:

Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopicstabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

4

Mech. Vibrations:

Types of Vibration, Degrees of freedom. Longitudinal Vibration: Single degree free and damped vibration. Forced vibration of single degree under harmonic excitation.Vibration isolation.Whirling of shaft and critical speed.

5

Unit III

Balancing:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,balancing of single cylinder engine, balancing of multi cylinder inline engines.

8

Unit IV

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor, Controlling force diagrams for Porter governor and spring controlled governors.

8

Unit V

Brakes and dynamometers:

Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

8

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

NME-604 : REFRIGERATION & AIR CONDITIONING **L T P**
3 1 0

Unit-1

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5

Refrigeration Equipment & Application:

Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

NPI- 601 : PRINCIPLES OF MACHINE TOOL DESIGN **L T P**
3 1 0

Unit-I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc.General requirement of machine tool design.Machine tool design process. Tool wear, force Analysis.

9

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, election of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

8

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

7

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

3

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports.

3

Layout of bearings, selection of bearings machine tools

2

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools.

5

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls.Basics of numerical controls.Machine tool testing.

3

Books :
1. Machine Tools Design & Numerical Controls by N.K. Mehta, McGraw-Hill
2. Design of Machine Tools by S.K. Basu Allied Publishers.
3. Principles of Machine Tools by Bhattacharya and Sen. New Central Book Agency.
4. Machine Tool Design Handbook by CMTI, McGraw-Hill.

NME-011 : ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduction:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Intgerlinear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern searchmethods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's andVariable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem fromarithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization,Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

NME-012: FINITE ELEMENT METHODS **L T P**
3 1 0

Unit 1
Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.
Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II
Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III
Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV
Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials.
Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V
Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.
Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning
3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

NME-013 : MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I

Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III

Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

NME-014: MECHATRONICS **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semi conductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semi conductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, “Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, “Introduction to Mechatronics & Measurement Systems, 4e”, McGraw-Hill Education, 2014.
3. M Jouaneh, “Fundamentals of Mechatronics”, Cengage Learning, 2013.
4. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
6. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, “Mechatronics”, McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. “Mechatronics: Integrated Mechanical Electronic Systems”, Wiley

NME-021 : FLUID MACHINERY **L T P**
2 1 0

UNIT-I

Introduction: Impulse of Jet and Impulse Turbines:

Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler’s fundamental equation.Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & *c*urve),Classification of turbines, Impulse turbines, Constructional details, Velocity triangles,Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power andefficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principlesof similarity, Unit and specific speed, Performance characteristics, Selection of waterturbines.

8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficienciesof centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV

Positive Displacement and other Pumps:

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.
Hydraulic ram, Jet pumps, Air lift pumps.

8

BOOKS:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.

10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

NME -022: PRODUCT DESIGN & DEVELOPMENT **L T P**
2 1 0

UNIT I:
Introduction to Product Design, Applications, Relevance, Product Definition, Scope, Design definitions, The role and nature of design, Old and new design methods, Design by evolution vs design by innovation. Examples such evolution of bicycle, safety razor etc. Need based development, Technology based developments. Physical realisability& Economic feasibility of design concepts.

8

UNIT II:
Morphology of Design, Divergent, Transformation and Convergent phases of product design, Identification of need, Analysis of need, Design criteria, Functional aspects, Aesthetics, ergonomics, form (structure). Shape, size, color, Creativity, Mental blocks in creativity, Removal of blocks, Ideation Techniques.

8

UNIT III:
Transformations stage of design, Brainstorming &Synectics, Morphological techniques, Utility concept, Utility value, Utility index, Economic aspects of design, Fixed and variable costs, Break-even analysis, Product Appraisal Information and literature search, patents, standards and codes, Environment and other safety considerations in product design.

8

UNIT IV:
Reliability, Reliability considerations in product design, Bath tub curve, Reliability of systems in series and parallel. Failure rates, MTTF and MTBF, Optimum spares from reliability consideration, Design of displays and controls, Man-Machine interface, Compatibility of displays and controls, Ergonomic aspects of design, Anthropometric data and its importance in design

8

Books and references:

1. Product Design & Manufacturing - A.K.Chitale&R.C.Gupta, Prentice Hall.
2. Engg . Product Design -C .D. Cain, Bussiness Books.
3. Product Design by Otto and Wood- Pearson
4. Industrial design for Engineers –W .H. Mayall, Itiffe.
5. Product Design & Decision Theory - M.K. Starr - Prentice Hall
6. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall.
7. Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
8. Human Factor Engg. – Mccormick E.J., McGraw-Hill.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H .Flurscheim, The Design Council - London.

NME-023: RELIABILITY ENGINEERING **L T P**
2 1 0

UNIT-I

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

6

UNIT-II

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

8

UNIT-III

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

10

UNIT-IV

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

4

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

4

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

NME-024 : UNCONVENTIONAL MANUFACTURING PROCESSES **L T P**
2 1 0

UNIT-I

Introduction, Limitations of conventional manufacturing processes, Need for unconventional manufacturing processes, its classification and future possibilities, Hybrid processes

4

Unconventional Machining Process based on material removal by abrasion, Principle and working and applications Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet machining and Ultrasonic Machining.

4

UNIT-II

Thermoelectric unconventional methods, Principle, working and applications of Plasma Arc Machining, Laser Beam Machining, Electron Beam Machining etc

4

Working principle and applications of Electric Discharge Machining, EDM machines, EDM process characteristics, Wire electric discharge machining

4

UNIT-III

Electro-chemical machining processes, ECM, its working principle, advantages and applications, Electro-chemical grinding, Electro-chemical deburring, Chemical machining.
Unconventional welding processes: Explosive welding, Cladding etc., Under water welding, Metalizing, Plasma are welding/cutting etc.

8

UNIT-IV

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-discharge forming, water hammer forming, explosive compaction etc.

5

Electronic-device Manufacturing, Diffusion and Photo- Lithography process for electronic-device manufacturing.

3

Books and references:

1. Modern Machining Processes – P.C. Pandey
2. Advanced Machining Processes, V.K. Jain, Allied Publishers.
3. Handbook of Manufacturing Processes, James G Bralla, Industrial Press.

NME-651 : FLUID MACHINERY Lab **L T P**
0 0 3

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

NME-652 : MACHINE DESIGN-II Lab **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

NME-653 : THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

NME-654 : REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 3

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.

6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

NPI-651 : MACHINE TOOL DESIGN LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Measurement and analysis of cutting forces in orthogonal turning.
2. Flank wear – time characteristics for single point cutting tools.
3. (i) Checking the level of installation of a lathe in horizontal & vertical planes

   (ii) Checking the bed ways for straightness and parallelism.
4. Testing the main spindle of a lathe for axial movement and true running.
5. Process capability determination of a center lathe.
6. Flatness checking of a surface plate.
7. A study of devices for intermittent motion used in machine tools e.g. ratchet gear & Geneva Mechanism.
8. A study of Kinematics structure of lathe/milling machine.
9. A study of the drives for reciprocation used in machine tools.
10. Development the speed chart and gearing diagram for a gassed head lathe.
11. A study of the cone pulley drive in center lathe and development of its raydiagram for the speed structure.
12. Efficiency testing of lathe at various parameters-values.
13. Accuracy analysis of finished cylindrical work-pieces produced on a lathe.
14. Cutting (turning) with inclined placed tool (in tool fixture).
15. Turning with two simultaneously cutting tool (one from front on usual tool postand the other tool from back on tool-fixture on carriage)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20016-17]

YEAR IV, SEMESTER-VII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-071 to 074	Open Elective -I	3	1	0	30	20	50	100	150	4
2	NME-701	CAD	3	1	0	30	20	50	100	150	4
3	NME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
4	NME-031 to NME-034	Departmental Elective – III	3	1	0	30	20	50	100	150	4
5	NME-041 to NME-044	Departmental Elective – IV	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-751	CAD/CAM Lab	0	0	2	10	10	20	30	50	1
6	NME-752	I. C. Engine and Automobile Lab.	0	0	2	10	10	20	30	50	1
7	NME-753	INDUSTRIAL TRG.	0	0	2	-	50	50	-	50	1
8	NME-754	PROJECT	0	0	3	-	50	50	-	50	2
	GP-701	GP	-	-	-	-	-	50	-	50	-
		TOTAL	15	5	9					1000	25

Note- Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through report and viva voce etc.
Project should be initiated in 7th semester beginning **(End Semester Examination to be conducted for evaluation for 7th sem),** and should be complete by the end of 8th semester with good Report and power-point Presentation etc.

Open Electives – I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Biotechnology

Departmental Elective III

NME-031 Computer Aided Manufacturing
NME-032 Project Management
NME-033 Computational Fluid Dynamics
NME-034 Composite materials

Departmental Elective IV

NME-041 Total Quality Management
NME-042 Thermal Turbo Machines
NME-043 Mechanical System Design
NME-044 Automation and Robotics

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NPI-801	Quality Control	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective –V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective -V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing.

NME-701: COMPUTER AIDED DESIGN (CAD) **L T P**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

8

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation .

8

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

8

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/Draftsight (any one)&3d solid modeling software Solidworks/Autodesk Inventor/PTC Creo /Catia (Any one)etc.

8

UNIT-V

Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

8

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India

2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill
4. CAD/CAM: Computer Aided Design and Manufacturing, by Groover, Pearson India
5. Mathematical Elements for Computer Graphics, buy Rogers and Adams, McGraw Hill
6. Finite Element Method By S S Rao
7. FE Analysis Theory and Programming, by Krishnamoorthy, Tata McGraw Hill

NME-702: AUTOMOBILE ENGINEERING **L T P**
3 1 0

UNIT-I

Introduction:

Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

6

UNIT-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

8

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

5

Chasis and Suspension System:

Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system,Air suspension & shock absorbers.

5

UNIT-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

4

UNIT-V

Emission standards and pollution control :

Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives and modern trends in automotive engine efficiency and emission control.

5

Maintenance system:

Preventive maintenance, break down maintenance and over hauling.

2

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automobile Engineering –TTTI, Pearson India
5. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.
7. Automobile Engineering –Ramakrishna, PHI, India

NME:801 POWER PLANT ENGINEERING **L T P**

3 1 0

UNIT-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations.

3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor.s profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

3

UNIT-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

8

UNIT-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, ubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

6

UNIT-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.

3

Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.

4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

2

UNIT-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc.

2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms.

3

Pollution

Pollution due to power generation

2

Books and References:

1. Power Plant Engineering, by F.T. Morse, Affiliated East-West Press Pvt. Ltd
2. Power Plant Engineering by Hedge, Pearson India
3. Power Plant Technology, by Wakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
6. Power Plant Engineering by Gupta, PHI India
7. Power Plant Engineering. Mahesh Verma, Metropolitan Book Company Pvt. Ltd.

NPI- 801 : **QUALITY CONTROL** **L T P**
3 1 0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability.

3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation.

5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

8

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.

3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.
MTBF. Maintainability, Condition monitoring and dignostic techniques.

4

Value Engineering : Elements of value analysis, Techniques.

2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts.

6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

2

Books and Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

NME-751:CAD/CAM LAB

L	T	P
0	1	2

Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.

3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

NME-752: I.C. ENGINES AND AUTOMOBILE LAB

L	T	P
0	0	2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.

8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

DEPARTMENT ELECTIVE-III

NME-031: COMPUTER AIDED MANUFACTURING (CAM) **L T P**
3 1 0

UNIT-I

Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

8

UNIT-II

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system.
Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

8

UNIT -III

Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.
System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

8

UNIT -IV

NC Part Programming- (a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.
(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

8

UNIT-V

Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

8

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.
6. CAD/CAM: Concepts and Applications by Alavala, PHI India
7. Computer Aided Manufacturing, by Srinivas, Oxford University Press.

NME-032: PROJECT MANAGEMENT **L T P**
3 1 0

UNIT-I
Project Management Concepts
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

8

UNIT-II
Project Organization & Project Contracts
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

8

UNIT-III
Project Appraisal & Cost Estimation
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

8

UNIT-IV
Project Planning & Scheduling
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

8

UNIT-V
Modification & Extensions of Network Models
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-

essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

8

Books and References :

1. Project Management by Harvey Maylor, Pearson India
2. Project Management by Choudhury, McGraw Hill
3. Project Management by K. Nagarajan
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
5. Project Management: A Life Cycle Approach by Kanda, PHI, India
6. Project Management and Appraisal, byKhatua, Oxford University Press.

NME-033: COMPUTATIONAL FLUID DYNAMICS **L T P**
3 1 0

UNIT- I
GOVERNING EQUATIONS AND BOUNDARY CONDITIONS:
Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averagedequations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behavior of PDEs onCFD. Elliptic, Parabolic and Hyperbolic equations.

8

UNIT -II
FINITE DIFFERENCE METHOD:
Derivation of finite difference equations. Simple Methods. General Methods for first and second orderaccuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations . Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

9

UNIT- III
FINITE VOLUME METHOD (FVM) FOR DIFFUSION:
Finite volume formulation for steady state One, Two and Three dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

9

UNIT -IV
FINITE VOLUME METHOD FOR CONVECTION DIFFUSION:
Steady one-dimensional convection and diffusion. Central, upwind differencing schemes-properties ofdiscretization schemes. Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICKSchemes.

10

UNIT- V
CALCULATION FLOW FIELD BY FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and itsvariants. Turbulence models, mixing length model, Two equation (k-Є) models. High and low Reynoldsnumber models

9

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis .
3. Computational Heat Transfer, by Jaluria ans Torrance, CRC Press
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.
9. Computational Fluid Dynamics: Principles and Applications, by Blazek, Elsevier Science & Technology.

NME-034: COMPOSITE MATERIALS **L T P**
3 1 0

UNIT-1

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

7

UNIT-II

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential.

7

UNIT-III

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.

10

UNIT-IV

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix

performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

10

UNIT-V

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

6

Books and References :

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy, by G. Dieter, McGraw Hill
3. Analysis and Performance of Fiber Composites, by Agarwal, McGraw Hill
4. Thermal Analysis of Materials, by R.F. Speyer, Marcel Decker
5. Engineering Mechanics and Composite Materials , by Daniels, Oxford University Press.
6. Engineering Materials: Polymers, Ceramics and Composites, by A.K Bhargava Prentice Hall India
7. Material Science and Engineering (SIE) with CD, by Smith, McGraw Hill

DEPARTMENT ELECTIVE-IV

NME-041: TOTAL QUALITY MANAGEMENT (TQM) **L T P**
3 1 0

UNIT -I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

4

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

4

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

3

UNIT -II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

5

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

3

UNIT -III

Tools and Techniques

Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart).

3

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

3

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

3

UNIT -IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

6

UNIT -V

IS0-9000 and its concept of Quality Management

ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT in some details.

6

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.
3. TQM in New Product manufacturing, H. G. Menon, McGraw Hill.
4. Total Quality Management, by Suri, Wiley.
5. Total Quality Management, by Subburaj, McGraw Hill.
6. Total Quality Management, by Poornima Chantimath, Pearson India
7. Quality Management by Bedi, Oxford University Press.
8. Total Quality Management-Text and Cases, by Janakiraman & Gopal, PHI, India.
9. Total Quality Management, H. Lal, Eastern Limited.
10. Total Quality Management, A. Arivalagar , R. S. Naagarazan, New Age International.

NME-042: THERMAL TURBOMACHINES **L T P**
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbomachinery, Energy transfer in turbo machines, Euler's equation, Definition of variousefficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology,Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps.

8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoitydiagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient,Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guidevanes, Centrifugal Compressor characteristic curves.

4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocitydiagram for axial compressor, Factors affecting stage pressure ratio, Blockage incompressor annulus, Degree of reaction, 3-D flow, Design process, blade design,calculation of stage performance, Axial compressor performance characteristic curves.

4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocitydiagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord,Estimation of stage performance, Characteristic curves.

4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

4

Pumps : Classification of Pumps, Main components, indicator diagram and modificationdue to piston acceleration, Performance characteristics, Cavitation and its control,Miscellaneous types of pumps.

4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropydiagram, State losses, Estimation of stage performance, Performance characteristics.

4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustionsystem types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparativeevaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Designwith traditional materials.

8

Books and References:

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Fundamentals of Turbomachinery by Venkanna, PHI, India
3. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.

4. Gas Turbine- Ganeshan, Tata Mc Graw Hill.
5. Thermal Turbomachines, by Singh, Wiley
6. Fundamentals of Turbomachinery, by Venkanna, PHI, India.

NME – 043: MECHANICAL SYSTEM DESIGN **L T P**
3 1 0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, types of system, Application of system concepts, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

4

Problem Formulation : Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

4

UNIT-II

System Theories: Introduction, System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

4

System modeling

Introduction, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

4

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.

4

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

4

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.

4

Calculus Method for Optimization

Model with single decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

4

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

5

Books and References:

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Engineering Design, by Dieter, McGraw Hill
3. Design Engineering-JR Dixon, TMH, New Delhi
4. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
5. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
6. Optimization Techniques-SS Rao
7. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

NME-044: AUTOMATION AND ROBOTICS **L T P**
3 1 0

UNIT- I

AUTOMATION:

Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation.

Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

7

UNIT- II

Manufacturing Automation:

Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

7

UNIT- III

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source.

Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous

transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

9

UNIT -IV

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

9

UNIT- V

ROBOT SIMULATION

Methods of robot programming, Simulation concept, Off-line programming, advantages of off-line programming.

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

8

Books and Reference :

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India
5. Robotics , by J.J. Craig, Addison-Wesley.
6. Industrial Robots , by Groover, McGraw Hill.
7. Robots & Manufacturing Automation, by Asfahl, Wiley
8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India
9. Automation & Robotics, byGhoshal, Oxford University Press.
10. Introduction to AI Robotics, by Murphy, PHI, India.

DEPARTMENT ELECTIVE-V

NME-051: OPERATIONS RESEARCH **L T P**

3 1 0

UNIT-I

Introduction: Basic of Operation Research, Origin & development of Operation Research,Applications.

2

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

7

UNIT-II

Transportation Problem: Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced Transportation Problem.

4

Assignment Problem: Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

3

UNIT-III

Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming.

4

Sequencing: Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

3

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

4

Simulation: Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

4

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

3

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

6

Books and References:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley & Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand.
7. Operation Research Application and Algorithms, by- Wayne L Winston, Duxbury Press.
8. Operations Research, by Jha, McGraw Hill.
9. Operation Research, by Yadav & Malik Oxford University Press
10. Operations Research, by Panneerselvam, PHI, India

NME-052 : DESIGN OF THERMAL SYSTEMS **L:T:P**
3:1: 0

Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

5

Design & Selection of Air conditioning Apparatus **:**Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

3

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation. Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

8

Unit-III

Turbomachines:Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

8

Unit-IV

Design of Heat Exchanger :Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

8

Books and References:

1. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.
2. Refrigeration & Air Conditioning - By C.P. Arora, McGraw Hill
3. Refrigeration & Air Conditioning - By Manohar Prasad, New Age
4. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
5. Refrigeration & Air Conditioning Data Book – Manohar Prasad, New Age
6. ASHRAE Hand Book of Fundamentals-ASHRAE
7. Refrigeration & Air Conditioning-Stoecker & Jones, Mc Graw Hill
8. Design of High Efficiency Turbomachinery and Gas Turbine by Wilsonm and Korakianitis, PHI, India
9. Turbines compressors and Fans by Yahaya, Mc Graw Hill
10. Heat Transfer Equipment Design by Shah, CRC Press
11. Thermal System Design and Optimization by Balaji, Ane Books Pvt Ltd

NME-053: ADVANCE SYNTHESIS OF MECHANISMS

L T P
3 1 0

UNIT-I

Introduction:

Mechanisms: Classifications, Relative and absolute motion, degree of freedom, 4-barMechanisms, planar and spatial mechanisms, Inversion and equivalent linkage,Transmission angle.

4

Kinematic analysis of Planer motion: Relative velocity, Instantaneous centre, Poles and centrodes, Relative acceleration.

4

UNIT-II

Kinematic Synthesis: Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials.

4

Four bar linkage, Equation of coupler curves, Double points and symmetry, RobertChebyshev theorem, Approximate and exact straight line mechanisms .

4

UNIT-III

Graphical Synthesis of Mechanisms:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crankMechanism. Synthesis of four bar mechanisms.

8

UNIT IV

Analytical Synthesis:

Displacement equation of four bar linkage, Crank and follower synthesis with threeaccuracy points, Four bar function generator with three accuracy points, Crank andfollower synthesis, angular velocities and accelerations

8

UNIT-V

Analytical Synthesis:
Synthesis of slider crank mechanism with three accuracy points, Synthesis of slidercrank mechanism with four accuracy points, cam and follower mechanism, Analysis of mechanical errors in linkage.

8

Books and References:

1. Kinematic Synthesis of Linkages RS Hartenberg and J Denavit McGraw Hill, New York
2. Kinematic and Linkage Design AS Hall Jr Prentice Hall India Ltd.
3. Mechanism and Machine Theory Amitabh Ghosh and AK Mallick
4. Mechanism Design: Analysis &Synthesis Erdman & Sandor Prentice Hall of India
5. Kinematics and Dynamics of machinery (SIE), by Norton, McGraw Hill

NME-054: INDUSTRIAL AUTOMATION –I **L T P**
3 1 0

Unit-I:
Historical perspective of Industrial Automation
- Origin, Evolution and Need / Demand of automation in industries, Current and future Trends
- Components of Industrial Automation System and their functionalities, Layers and Types of Automation

6

Unit -II:
Automation Controllers
- Introduction of Industrial Controllers
- Programmable Logic Controller: Constructions, Types, Programming Units, Memory, I/O Modules.
- Programming methodology
- Ladder Logic programming for Industrial Applications, Timers and Counters
- Selection criteria of PLC
- Examples of PLC application

10

Unit-III:
Industrial Switching Elements
- Electronic Logic gates
- Relays, Solenoids
- Pneumatic Valves and Actuators
- Hydraulic valves and Actuators
- Interfacing: Control of Hydraulics and Pneumatics with Electric Signals
- Comparison between different switching elements

10

Unit-IV:
Visualization: Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA) Systems:

- Need for HMI
- Hardware based HMI panels
- PC based HMI Systems – SCADA
- Different Functionalities
- Benefits of implementing SCADA systems
- Case Studies of SCADA implementation.

10

Unit V:

Case Study

- Hydraulic / Pneumatic Press
- Material handling System
- Machine Tool: NC/CNC Machine

4

Books and References :

1. Programmable Logic Controllers with Control Logix, by Jon Stenerson, Delmar Publishers, 2009.
2. Hand book of industrial Automation, by Richard L Shell and Ernest L Hall, Marcel Dekker Inc., 2000.
3. Practical SCADA for Industry, by David Bailey and Edwin Wright, Newness Publishers, 2003.
4. Automation network Selection, by Dick Caro, ISA – The Instrumentation Systems and Automation Society, 2004.
5. Getting Factory Automation Right (the first time), by Edwin H Zimmerman, Manufacturing Engineers, 2001.
6. Automation, Production Systems and Computer Integrated Manufacturing, by Groover, Pearson India.
7. Industrial Instrumentation and Control, by Singh, McGraw Hill.

NME-055: ADVANCED WELDING TECHNOLOGY **L T P**
3 1 0

UNIT-I

Introduction: Welding as compared with other fabrication processes,Importance and application of welding, classification of welding processes, Health & safety measures in welding.

3

Welding Power Sources: Physics of welding Arc**,** Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

3

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

4

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

3

UNIT-II

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrogas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

11

UNIT-III

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

5

UNIT-IV

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

2

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.

4

UNIT-V

Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

5

Books and References:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principals and Practices, by- Edwars R. Bohnart, McGraw Hill Education.
3. Welding Engineering and Technology, by- R. S. Parmar, Khanna Publishsers.
4. Welding Handbooks (Vol. I & II).

DEPARTMENT ELECTIVE-VI

NME- 061: EXPERIMENTAL STRESS ANALYSIS **L T P**
3 1 0

UNIT -I

Stress: Introduction, Two-Dimensional State of Stress, Equations of Equilibrium, Stress Transformation relations, principal Stresses, Special States of Stress.

4

Strain: Introduction, Displacement and Strain, Strain Transformation relations, principal strains, Stress Strain Relations, for Two-Dimensional State of Stress.

4

UNIT- II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis.

4

Brittle Coating Method: Introduction, Coating Stresses, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

4

UNIT -III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor.

4

Strain Gage Circuit: Potentiometer, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.Three Element Rectangular Rosette

4

UNIT- IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Stressed Model in Circular Polariscope.

8

UNIT -V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method.

8

Books and References :

1. Experimental Stress Analysis, by U C Jindal, Pearson India
2. Experiment Stress Analysis, by James W. Dally and William F. Riley, McGraw-Hill International
3. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.
4. Advance Strength and Applied Stress Analysis, by Budynas, McGraw-Hill

NME- 062: PLANT LAYOUT AND MATERIAL HANDELING **L T P**
310

UNIT -I

Introduction

Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

8

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design

Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

8

UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic.

Material Handling: Material handling principles; material handling equipment and material handling systems.

8

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. **Warehouse operations**: function, storage operations.

Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems,

Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.

8

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

8

Books and References:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6. Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons.
7. Plant Design and Economics, by- Peters, McGraw Hill Education.
8. Purchasing and Material Management, by- Gopalakrishnan, McGraw Hill Education.

NME-063: ADDITIVE MANUFACTURING

L	T	P
3	1	0

UNIT-I

Introduction

History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, **Direct and Indirect Processes;** Prototyping, Manufacturing and Tooling.

4

Layer Manufacturing Processes; Polymerization, Sintering and Melting, Extrusion, Powder-Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosolprinting and Bioplotter.

4

UNIT-II

Development of Additive Manufacturing Technology

Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems.

3

Generalized Additive Manufacturing Process Chain; The Eight Steps in Additive Manufacturing, Variation from one AM Machine to Another, Metal System, Maintenance of Equipment, Material Handling Issue, Design of AM.

5

UNIT-III

Additive Manufacturing Processes

Vat Photopolymerization; Materials, Reaction Rates, Photopolymerization Process Modeling, Scan Patterns, **Powder Bed Fusion Processes;** Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling, **Extrusion Based System;** Basic principles, plotting and Path Control, Bioextrusion, Other Systems, **Material Jetting;** Materials, Material Processing Fundamentals, Material Jetting Machines, **Binder Jetting;** Materials, Process Variations, BJ Machines, **Sheet lamination Processes;** Materials, Ultrosonic Additive Manufacturing, **Directed Energy Deposition Processes;** General DED Process Description, Material Delivery, DED systems, Process Parameters, Processiong-Structure-Properties Relationships, **Direct Write Technologies;** Ink-Based DW, laser Transfer DW, Thermal Spray DW, Beam Deposition DW, Liquid Phase Direct Deposition, Hybrid Technologies.

8

UNIT-IV

Design & Software Issues

Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM.

4

Software Issue for Additive Manufacturing; Introduction, Preperation of CAD Models: The STL file, Problem with STL file, STL file Manupulation, Beyond the STL file, Additional Software to Assist AM.

4

UNIT-V

Material Design & Quality Aspects

Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Intellectual Property, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing, Business Opportunities

4

Applications

Aerospace, Automotive, Manufacturing, Architectural Engineering, Art, Jewelry, Toys, Medical, Biomedical, Dental, Bio-printing, Tissue & Organ Engineering and many others.

4

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson , DSavid W. Rosen , Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
4. Rapid Prototyping: Principles and Applications, by - Chee Kai Chua, Kah Fai Leong, Chu Sing Lim.

NME-064: COMPUTER AIDED PROCESS PLANNING **L T P**
3 1 0

UNIT-I

Introduction to CAPP: Principles, scope and information requirement for CAPP, Role of process planning, Manual and experienced based process planning, Advantages of CAPP over conventional process planning, Decision table and decision trees, process capability analysis, Tolerance analysis, Variant process planning, Generative approach, Forward and Backward planning.

8

UNIT-II

Computer Aided Process Planning: Logical design of process planning systems, Implementation considerations, Computer based process monitoring and control, Computer and process interfacing, Totally integrated process planning systems, Process planning for rotational and prismatic parts, Machining of curves and surfaces, Five axis machining, Process planning of freedom surfaces, Development of NC codes, Computer aided design of fixtures, Inspection policies and inspection planning, Expert systems and their use in developing process planning systems.

8

UNIT-III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications. Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples. Generative CAPP system: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

8

UNIT-IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes, design and manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances.

8

UNIT-V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods. Implementation techniques for CAPP: MIPLAN system, Computer programming languages tbr CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

8

Books and References:

1. Production Systems and Computer Integrated Manufacturing System, by- Mikell P Groover, Prentice Hall.
2. Computer Processing of Remotely Sensed Images: An Introduction, 3rd Edition, by- Mather Paul, Wiley.
3. Computer Aided Process Control, by- SK Singh, PHI Learning Pvt. Ltd.
4. Computer Aided Design and Manufacturing, by- M. Sarcar, K. L. Narayan, PHI Learning Pvt. Ltd.

NME-065: NON-DESTRUCTIVE TESTING **L T P**
3 1 0

Unit-I

Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

6

Unit-II

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zyglo test, Illustrative examples and interpretation of defects.

5

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Non-ferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

5

Unit-III

Radiographic methods

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ-ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

8

Unit-IV

Ultrasonic testing methods

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

8

Unit-V

Special NDT Techniques

Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

8

Books and References:

1. Non-Destructive Testing and Evaluation of Materials, by- Prasad, McGraw Hill Education.
2. Basics of Non-Destructive Testing, by Lari & Kumar, KATSON Books.
3. Practical Non-destructive Testing, by- Baldev Raj, T. Jayakumar, M. Thavasimuthu, Woodhead Publishing.
4. Non-Destructive Testing Techniques, by- Ravi Prakash, New Age International.
5. Nondestructive Testing Handbook,by Robert C. McMaster, American Society for Nondestructive.
6. Introduction to Nondestructive Testing: A Training Guide, by- Paul E. Mix, wiley.
7. Electrical and Magnetic Methods of Non-destructive Testing, by- J. Blitz, springer.

Syllabus 2018-19

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

LUCKNOW

Study & Evaluation Scheme with Syllabus

for

B.Tech. Second Year

Civil Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
4.	RCE301	Building Materials & Construction	3-1-0	70	20	10	100	4
5.	RCE302	Surveying	3-0-0	70	20	10	100	3
6.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
7.	RCE351	Building Materials Lab	0-0-2	50	30	20	100	1
8.	RCE352	Surveying Lab	0-0-2	50	30	20	100	1
9.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
10.	RCE354	Computer Based Statistical & Numerical Techniques Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	RCS405	Data Structures	3-0-0	70	20	10	100	3
4.	RCE401	Hydraulics & Hydraulic Machines	3-0-0	70	20	10	100	3
5.	RCE402	Geoinformatics	3-0-0	70	20	10	100	3
6.	RCE403	Structural Analysis	3-1-0	70	20	10	100	4
7.	RCE452	Geoinformatics Lab	0-0-2	50	30	20	100	1
8.	RCE453	Structural Analysis Lab	0-0-2	50	30	20	100	1
9.	RCE454	Building Planning & Drawing Lab	0-0-2	50	30	20	100	1
10.	RCE455	Hydraulics & Machine Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Industrial Training:
Students will go for Industrial Training of 8-10 weeks in total in two parts (Industrial Training-1 & Industrial Training-2) which is to be evaluated in VII semester after submission of separate training report for each part.
Industrial Training-1: Students will go to Industrial Training-1 of 4 weeks after IV semester which will be evaluated in VII semester.

Science Based Open Electives:
a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

RCE301: BUILDING MATERIALS & CONSTRUCTION

UNIT I

Scope of Study of building Materials: building materials and their performance, economics of the building materials. **Stones:** Requirement of good building stone, characteristics of building stone sand their testing. Common building stones. Methods of preservation of stones. **Bricks**: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. **Gypsum**: properties of gypsum plaster, building products made of gypsum and their uses. **Lime**: Manufacture of lime, classifications of limes, properties of lime. **Cement**: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement. **Cement Concrete**: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete. **Pozzolona**: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. **Timber**: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor saffecting strength of timber, Methods of seasoning and preservation of timber. Wood based products. **Asphalt:** Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

UNIT II

Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. **Paint svarnishes and distempers:** Common constituents, types and desirable properties, Cement paints. **Ferrous metals:** Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcings telemechanical and physical Properties chemical composition. Brief discussion on properties and uses of Aluminum and lead. **Glass**: Ingredients, properties types and use in construction. **Insulating Materials**: Thermal and sound insulating material, desirable properties and types.

UNIT III

Buildings: Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, antitermite treatment in buildings, Vertical circulation means: stair cases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonary construction. Cavity wall & hollow block construction.

UNIT IV

Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning.

UNIT V

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance.

References:

1. SK Duggal, “Building Materials” New Age International
2. Purushothama Raj, “Building Construction Materials & Techniques” Pearson Edu.
3. PC Varghese, “Building Materials” PHI
4. Rangwala, “Building Materials” Charotar Publishing House.
5. Sushil Kumar, “Building Construction” Standard Publisher.
6. Domone, “Construction Materials” 4/e, CRC Press Taylor & Francis Group.
7. Adams, “Adams’ Building Construction Adams” CRC Press Taylor & Francis Group.
8. BC Punmia, “Building Construction” Laxmi Publication.
9. Jha & Sinha, “Building Construction” Khanna Publishers
10. Sahu, “Building Materials and Construction” Mc Grew Hill Education
11. Deodhar, “Civil Engineering Materials” Khanna Publishers
12. Mehta, “Building Construction Principles, Materials & Systems” 2/e, Pearson Education Noida.
13. Sandeep Mantri, “Practical building Construction and its Management” Satya Publisher, New Delhi.

RCE302: SURVEYING

UNIT I

Surveying: definition, divisions, classification and principles of surveying. Scales: plain, vernier, diagonal, plan and map. Accuracy and errors: definitions, sources and kinds of errors, application of probability for computation of errors, laws of weights.

UNIT II

Linear measurement: chain and tape surveying, types of chain and tape, ranging, obstacles and tape correction. Compass surveying: Measurement of directions, Reference meridians, bearing and azimuths, local attraction. Theodolite survey: Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control,working of Electronic Theodolites.

UNIT III

Leveling: Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, use of Automatic level, Digital Level, Vertical Control. Contouring: contours, contour interval, horizontal equivalent, characteristics, methods and interpolation, use to prepare profiles. Tachometry: Principles of stadia systems, subtense bar and tangential methods.

UNIT IV

Traversing and triangulation: Principles of traversing by compass and theodolite, computations of traverse coordinates, omitted measurements, Principles and classification of triangulation systems, strength of figures, satellite stations, and triangulation field work. Introduction to modern surveying Instruments /Techniques like total station.

UNIT V

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. Survey Layout for culverts, canals, bridges, road/railway alignment and buildings.

References:

1. Schofield, “Engineering Surveying” 6/e, CRC Press Taylor & Francis Group.
2. BC Punamia et al: Surveying Vol. I, II, Laxmi Publication
3. Bannister, “Surveying” 7/e, Pearson Education, Noida.
4. AM Chandra: Plane Surveying, Higher Surveying, Narosa Pub.
5. AK Dey Plain Survey, S Chand
6. SK Duggal: Surveying Vol. I, II.
7. R Subramanian : Surveying & Leveling , Oxford University Press
8. C Venkatramaih : Text Book of Surveying , University Press
9. Charles D. Ghilani, Elementary Surveying Pearson Education
10. R. Agor, “Surveying and Levelling” Khanna Publishers.

RCE303: FLUID MECHANICS

UNIT I

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

UNIT III

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control.

UNIT V

Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance.

References :

1. Hibbler, "Fluid Mechanicsin SI Units" 1/e Pearson Education, Noida.
2. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,
3. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
4. Katz, "Introductory Fluid Mechanics" Cambridge University Press
5. Pnueli & Gutfinger, "Fluid Mechanics" Cambridge University Press
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida
8. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor & Francis Group.
9. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor & Francis Group.
10. AK Jain "Fluid Mechanics" Khanna Publication.
11. White,F.M. "Fluid Mechanics" TMH, New Delhi.
12. Munsen et al , "Fundamental of Fluid Mechanics" Wiley Newyork Ltd

13. Garde, R.J., " Fluid Mechanics", SciTech Publications Pvt. Ltd
14. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student.
15. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
16. Jagdish Lal "Fluid Mechanics"
17. N Narayan Pillai " Principles of Fluid Mechanics & Fluid Machines" Universities Press.
18. Esposito, Fluid Power & Applications" 7/e Pearson Education, Noida.
19. DR Malhotra & Malhotra, "Fluid Mechanics Hydraulics & Hydraulic Machines" Satya Prakashan, New Delhi.

RCE351/ RCE451: BUILDING MATERIALS LAB

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

RCE352: SURVEYING LAB

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method.
10. To plot contour map of given area.

RCE353: FLUID MECHANICS LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

RCE354: COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

Write computer program in C/C^{++} /visual basic for mathematical and engineering solutions.

1. Write a code for finding out the root of the algebraic and transcendental equations using Newton-Raphson's iterative method.
2. Write a computer program for inversion of matrix.
3. Write a computer program for Eigen value solution of matrix.
4. Write a computer program for Runge Kutta fourth order method (RK4) to solve ordinary differential equation.
5. Write a computer program to find the engineering properties of I and channel sections.
6. Write a computer program to solve simultaneous linear equations.
7. Write the program to implement the Gauss forward interpolation formula and back ward interpolation formula.
8. Write code for one dimensional heat equation and one dimensional fluid flow problem (boundary value problem).

RCE401: HYDRAULICS & HYDRAULIC MACHINES

UNIT I

Introduction : Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critcal and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections.

UNIT II

Energy-Depth relationship: Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods.

UNIT III

Rapidly varied flow: hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds. Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

UNIT IV

Impulse momentum equation- Impact of Jets-plane and curved- stationary and moving plates.
Pumps: Positive displacement pumps - reciprocating pumps - operating principles -slip - indicator diagram - separation- air vessels. centrifugal pumps - operation - velocity triangles - performance curves - Cavitation - Multi staging - Selection of pumps.

UNIT V

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References:

1. Chow,V.T. "Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
8. AK Jain "Fluid Mechanics" Khanna Publication.
9. Houghtalen, "Fundamentals of Hydraulics Engineering Systems" 4/e Pearson Education, Noida.

RCE402: GEOINFORMATICS

UNIT I

Photogrammetric Survey, basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.

UNIT II

Remote Sensing, Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites.

UNIT III

Digital image processing: introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.

UNIT IV

GIS system: Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.

UNIT V

Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications.

References:

1. Sateesh Gopi, R Sathkumar & N Madhu “Advanced Surveying GIS & Remote Sensing” Pearson Education.
2. Kang Tshung Chang “Introduction of Geographic Information Systems” TMH.
3. Campbell, “Introduction to Remote Sensing” 3/e, CRC Press Taylor & Francis Group.
4. Chen, “Signal and Image Processing for Remote Sensing” CRC Press Taylor & Francis Group.
5. A M Chandra: Higher Surveying Narosa Pub.
6. B C Punamia: Higher Surveying Laxmi Publication
7. T M Lillesand et al: Remote Sensing & Image Interpretation
8. R. Agor, “Advanced Surveying” Khanna Publishers.
9. B. Bhatta: Remote Sensing & GIS TMH.
10. M Anjireddy: Remote Sensing & GIS, BS Publications
11. Narayan Panigrahi “Geographical Information Science” Universities Press.

12. N K Agarwal: Essentials of GPS, Spatial Networks: Hyderabad.
13. George Joseph “Fundamental of Remote Sensing” Universities press.
14. GS Srivastava “An Introduction to Geoinformatics” TMH.
15. Ahmed EI Rabbany, “Introduction to GPS The Global Positioning System” Artech House, Boston.
16. Chor Pang Lo, “Concepts & Techniques of Geographic Information Systems” 2/e, Pearson Education

RCE403: STRUCTURAL ANALYSIS

UNIT I

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable.

UNIT II

Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.

UNIT III

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's theorems, Calculations of deflections: Strain Energy Method, unit load method& for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method.

UNIT IV

Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures.

UNIT V

Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.

References

1. Hibbler, "Structural Analysis", Pearson Education
2. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
3. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
4. T S Thandavmorthy, "Analysis of Structures", Oxford University Press 5.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
5. Temoshenko & Young "Theory of Structure" Tata Mc Grew Hill.
6. Reddy, CS, "Basic Structural Analysis", Tata McGraw Hill.
7. Jain, OP and Jain, BK, "Theory & Analysis of Structures ". Vol.I & II Nem Chand.
8. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
9. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
10. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
11. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
12. S Ramamurtham "Theory of Structure" Dhanpat Rai.
13. Devdas Menon "Advanced Structural Analysis" Narosa
14. Wang, CK, "Intermediate Structural Analysis", Tata Mc-Graw Hill.
15. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
16. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis

Group.
17. Bibek Kumar Mukherjee, “Theory and Analysis of Structures” Satya Prakashan, New Delhi.
18. Jacques Heyman, “Structural Analysis” Cambridge University Press.

RCE452: GEOINFORMATICS LAB

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

RCE453: STRUCTURAL ANALYSIS LAB

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell’s Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

RCE454: BUILDING PLANNING & DRAWING LAB

Drawing and drafting of following with CAD software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

RCE455: HYDRAULICS & MACHINE LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. THIRD YEAR

(CIVIL ENGINEERING)

On

Choice Based Credit System

[Effective from session 2018-19]

FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS501	MANEGIRIAL ECONOMICS	Applied Science	3—0---0	70	20	10	100	3
2	RAS-502/ RUC501	SOCIOLOGY /CYBER SECURITY	Applied Science	3—0---0	70	20	10	100	3
3	RCE501	GEOTECHNICAL ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE502	DESIGN OF STRUCTURE-I	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE503	QUANTITY ESTIMATION AND MANAGEMENT	Core Deptt.	3—0---0	70	20	10	100	3
6	RCE051 RCE052 RCE053	**ELECTIVE -1** MODERN CONSTRUCTION MATERIALS CONCRETE TECHNOLOGY GEOENVIRONMENTAL	Core Deptt.	3—1--0	70	20	10	100	4

		ENGINEERING							
7	RCE551	GEOTECHNICAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
8	RCE552	CAD LAB-1	Core Deptt.	0—0---2	50		50	100	1
9	RCE553	CONSTRUCTION MANAGEMENT LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE554	CONCRETE LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

SESSION 2018-19

RCE 501 GEOTECHNICAL ENGINEERING (L-T-P 3-0-0) Credit - 3

Unit 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standard soil classification system. **[8]**

Unit 2

Soil Hydraulics: Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, uplift pressure, piping; **[8]**

Unit 3

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

Consolidation: Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, Contact pressure **[8]**

Unit 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine's approaches for frictional and c-φ soils, inclined backfill, Graphical methods of earth pressure determination, Stability of slopes , Culman method & Method of slices, Stability number & chart. **[8]**

Unit 5

Sub surface structure: Bearing capacity of shallow foundations, SPT, Plate load test; Effect of water table.

Deep foundations: Types of piles, Static and dynamic formulae, Pile group, Settlement of Pile Group, Negative skin friction. **[8]**

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.

4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
10. P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
12. Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 502 DESIGN OF STRUCTURE 1 (L-T-P 3-1-0) Credit- 4

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint by Slope-Deflection method, Moment Distribution method and Strain Energy method. **[8]**

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged and fixed arches, Influence line diagrams for maximum bending moment, Shear force and thrust in two hinge arches. Analysis of two and three hinged stiffening girders. **[8]**

Unit – 3

Introduction to Suspension Bridges, Analysis of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. **[8]**

Unit – 4

Basic Force and Displacement Matrix method for analysis of beams, frames and trusses. **[8]**

Unit – 5

Basics of Plastic Analysis. Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Single Storied Frames. **[8]**

References:

1. Jain, A. K., "Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C., "Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.

4. Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
5. Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.
6. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
7. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
8. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi.
9. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
10. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
11. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
12. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
13. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
14. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
15. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
16. S Ramamurtham "Theory of Structure" Dhanpat Rai.
17. Devdas Menon "Advanced Structural Analysis" Narosa
18. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
19. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis Group.
20. R Agor, Structural Analysis, " Khanna Book Publishing.
21. Jacques Heyman, "Structural Analysis" Cambridge University Press.

RCE 503 QUANTITY ESTIMATION & MANAGEMENT (L-T-P 3-0-0) Credit - 3

UNIT I: Quantity Estimation for Buildings

Measurement units for various building materials, Centreline method, Long and short wall method of estimates, PWD schedule of rate, Delhi schedule of rate. **[8]**

UNIT II: Rate Analysis, Specification and Tenders

Analysis of rates knowing cost of material, labour, equipment, overheads, profit, taxes etc, Specifications – Preparation of detailed and general specifications, Legal aspects of contracts, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items. **[8]**

UNIT III: Elements of Management & Network Techniques

Project cycle, Organization, planning, scheduling**,** monitoring, updating and management system

in construction, Bar charts, milestone charts, work break down structure and preparation of networks. Network Techniques like PERT & CPM in construction management. Project monitoring and resource allocation through network techniques. **[8]**

UNIT IV: Equipment Management

Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, earth compaction, Hauling Equipment, Hoisting Equipment, Conveying Equipment, Concrete Production Equipment, Tunnelling Equipment **[8]**

UNIT V: Project Cost Management

Budgeting, Cost planning, Direct Cost, Indirect cost, Total Cost Curve, Cost Slope. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method Equivalent annual cost method, discounted cash flow method, Depreciation and break even cost analysis. **[8]**

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500 004

4. Construction Management by Ojha

5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.

6. Construction Technology by Sarkar, Oxford

7. Delhi Schedule of Rates (latest version)

8. S V Deodhar and SC Sharma, "Costruction Engineering and Management, Khanna Publishing house.

RCE 051 MODERN CONSTRUCTION MATERIALS (L-T-P 3-0-0) Credit - 3

Unit – 1

Introduction, properties and uses of modern building materials: fly ash bricks, soil - cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC) , glass reinforced gypsum. **[8]**

Unit – 2

Introduction , properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals ,paints ,tiles ,bricks, glass),metals, light - weight concrete, mass concrete, waste material based concrete. **[8]**

Unit – 3

Introduction , properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, pre fabricated systems. **[8]**

Unit – 4

Introduction , properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete. **[8]**

Unit – 5

Introduction , properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials(thermal, sound and electrical insulating materials).Concept of polymer floor finishes. **[8]**

Reference Book:

1) Ghambhir M.L."Concrete Technology" Tata McGraw Hill education private Limited.
2) A.R. Santhakumar, Concrete Technology, Oxford University Press.
3) Building Materials, P.C. Varghese, Prentice-Hall India.
4) Shetty, M. S., "Concrete Technology" S. Chand Publication.
5) Krishnaraju .N., Advanced Concrete Technology, CBS Published.
6) Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
7) Nevile. A.M., Concrete Technology, Prentice Hall, Newyork.
8) Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication pvt.ltd.
9) Materials Science and Engineering, V. Raghavan, Prentice Hall.
10) Properties of Engineering Materials, R.A. Higgins, Industrial Press.
11) Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press.
12) The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall.
13) Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann.
14) The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin.
15) Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill.
16) S K Sharma, "Civil Engineering and construction material," Khanna Publuishing House.
17) Properties of concrete, A.M. Neville, Pearson.

RCE 052 CONCRETE TECHNOLOGY (L-T-P 3-0-0) Credit - 3

Unit I

Cement: production, composition properties, types and cement chemistry. Introduction to supplementary cementitious materials. Aggregates: mineralogy, properties, test and standards. Quality of water for use in concrete. **[8]**

Unit II

Introduction & study of accelerators, retarders, water reducers, air entrainers , water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume , ground granulated blast furnace slag, metakaoline and pozzolana; their production, properties and effect on concrete properties . **[8]**

Unit III

Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete: packing density, Rheology, mix design examples. **[8]**

Unit IV

Concert production, batching, mixing and transportation of concrete. Workability: test for work ability of concrete (slump test, compacting factor test and Vee Bee test). Segregation and bleeding in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules , poisson's ratio, creep, shrinkage and durability of concrete . **[8]**

Unit V

Study and uses of high strength concrete, self compacting concrete, fiber reinforced concrete, ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India. **[8]**

References

1. Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS.
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
3. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
4. Santha kumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.
5. Gupta B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
6. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS".EDT BY L.Holliday. Elsevier Publishing Company. 1966.
7. Popovics. S., "FUNDAMENTALS OF PORTLAND CEMENT CONCRETE: A Quantitative Approach VOL 1 FRESH CONCRETE" JOHN WILEY & SONS.1982.

8. P.K. Mehta and Paulo J.M. Monteiro, "Concrete: microstructure, properties and materials", The Mc Graw Hill Companies.
9. Jayant D. Bapat (2013), Mineral admixtures in cement and concrete, Taylor and Francis group.
10. Concrete mix proportioning as per IS 10262:2009 – Comparison with IS 10262:1982 and ACI 211.1-91 M.C. Nataraja and Lelin Das
11. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
12. IS456-2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi, 2000.

RCE 053 GEOENVIRONMENTAL ENGINEERING (L-T-P 3-0-0) Credit - 3

UNIT-1 Fundamentals of Geoenvironmental Engineering

Scope of geoenvironmental engineering - multiphase behaviour of soil – role of soil in geoenvironmental applications – importance of soil physics, soil chemistry, hydrogeology, biological process – sources and type of ground contamination – impact of ground contamination on geoenvironment - case histories on geoenvironmental problems. **[8]**

UNIT-2 Soil-Water-Contaminant Interaction

Soil mineralogy characterization and its significance in determining soil behaviour – soil-water interaction and concepts of double layer, forces of interaction between soil particles, concepts of unsaturated soil, water flow in saturated and unsaturated zone, soil-water-contaminant interactions and its implications, factors effecting retention and transport of contaminants. **[8]**

UNIT-3 Waste Containment System

Evolution of waste containment facilities and disposal practices, Site selection based on environmental impact assessment ,different role of soil in waste containment, different components of waste containment system and its stability issues , property evaluation for checking soil suitability for waste containment . **[8]**

UNIT-4 Contaminant Site Remediation

Site characterization, risk assessment of contaminated site, remediation methods for soil and groundwater, selection and planning of remediation methods. **[8]**

UNIT-5 Advanced Soil Characterization

Contaminant analysis, water content and permeability measurements, electrical and thermal property evaluation, use of GPR for site evaluation, introduction to geotechnical centrifuge modeling. **[8]**

Text

1. Yong, R. N., "Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation" CRC Press, New York, 2001.
2. Sharma H.D. and Reddy K.R., "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies" John Wiley & Sons, Inc., USA, 2004.
3. Fredlund D.G. and Rahardjo, H., "Soil Mechanics for Unsaturated Soils" Wiley-Interscience, USA, 1993.
4. Mitchell, J. K., "Fundamentals of Soil Behaviour" Wiley, 2005.
5. Hillel D., "Introduction to Environmental Soil Physics" Academic Press, New York, 2003.
6. Rowe R.K., "Geotechnical and Geoenvironmental Engineering Handbook" Kluwer Academic Publications, London, 2000.
7. Reddi L.N. and Inyang, H. I., "Geoenvironmental Engineering, Principles and Applications" Marcel Dekker Inc. New York, 2000.

References

1. Hillel D., "Introduction to Soil Physics" Academic Press, New York, 1982.
2. Sparks, D.L., "Environmental Soil Chemistry" Academic Press, New York, 2002.
3. Bagchi, A., "Design of landfills and integrated solid waste management" John Wiley & Sons, Inc., USA, 2004.
4. O.P. Gupta, Elements of Environmental Chemistry, Khanna Publishing House
5. Alvarez-Benedi J. and Munoz-Carpena, R., "Soil-Water-Solute Process Characterization: An Integrated Approach" CRC Press, New York, 2005.
6. Berkowitz, B. Dror, I. and Yaron, B., "Contaminant Geochemistry" Springer, Germany, 2008.
7. Mohamed, A. M. O., "Principles and Applications of Time Domain Electrometry in Geoenvironmental Engineering" Taylor and Francis, New York, 2006.
8. O P Gupta, Elements of land and soil pollution, Khanna Publishing House

RCE-551 GEOTECHNICAL ENGINEERING LAB (L-T-P 0-0-2) Credit- 1

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Determination of shear strength of soil by Direct shear test.

8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remoulded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

RCE 552 CAD LAB 1 **(L-T-P0-0-2) Credit- 1**

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

RCE 553 CONSTRUCTION MANAGEMENT LAB (L-T-P 0-0-2) Credit-1

1. Estimation of quantities for any one of the following: Building/ Septic tank/Water supply pipe line/road/bridge.
2. Preparation of Bill of Quantities (BOQ) for above project.
3. Practice of MS Project/Primavera software for same problem.
4. Study of any full set of tender documents (Institute shall provide the set from ongoing/ completed tenders).

These exercises will be done through use of software and spread in 8-10 classes.

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500 004
4. Construction Management by Ojha
5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.
6. Construction Technology by Sarkar, Oxford
7. S V Deodhar and SC Sharma, " Contruction engineering and Management", Khanna Publishing House.
7. Delhi Schedule of Rates (latest version)

RCE 554 CONCRETE LAB **(L-T-P 0-0-2) Credit- 1**

1. Study of IS codes for (i) Aggregates (ii) Cements (iii) Admixtures (iv) Fly ash
2. Concrete Mix design computation by ACI 211.1-91 method, IS code method as per 10262-2007 & 456-2000, DOE method for given sample.
3. Preparation and testing of samples as per any one of the above mentioned computations (Minimum grade of concrete is M30)
4. Tests on Concrete- (a) Workability tests - Slump cone test, compaction factor test, Vee-bee consistometer test, flow table test. (b) Strength tests- compressive strength, flexural strength, split tensile strength.
5. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
6. Non destructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

References:

1. Concrete Technology – A.M. Neville & J. J. Brooks , Pearson
2. Concrete Technology Theory & Practice-M.S. Shetty, S. Chand Publishers
3. Concrete Technology Theory & Practice-M.L. Gambhir, TMH Publishers
4. IS:10262-2009-Concrete Mix Proportioning Guidelines

SIXTH SEMESTER

CIVIL ENGINEERING

SESSION 2018-19

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS601	INDUSTRIAL MANAGEMENT	Applied Science	3—0---0	70	20	10	100	3
2	RUC601/ RAS602	CYBER SECURITY/SOCIOLOGY	Applied Science	3—0---0	70	20	10	100	3
3	RCE601	DESIGN OF STRUCTURE-II	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE602	ENVIRONMENTAL ENGINEERING	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE603	TRANSPORTATION ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
6	RCE061 REC062 RCE063	**ELECTIVE -2** FOUNDATION DESIGN INTEGRATED WASTE MANAGEMENT FOR A SMART CITY GEOSYNTHESIS AND REINFORCED SOIL STRUCTURES	Core Deptt.	3—1---0	70	20	10	100	4
7	RCE651	CAD LAB-2	Core Deptt.	0—0---2	50		50	100	1
8	RCE652	ENVIRONMENTAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
9	RCE653	TRANSPORTATION ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE 654	STRUCTURAL DETAILING LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

RCE 601 DESIGN OF STRUCTURE -II (L-T-P 3-0-0) Credits - 3

Unit – 1

Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method**.** **[8]**

Unit – 2

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear.

Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. **[8]**

Unit – 3

Design of one way, One way continuous and cantilever solid slabs by Limit State Design Method, Design of RCC staircases.

Design of lintels and chajjas. Design of two way slabs by limit state method, Serviceability Limit States, Control of deflection, cracking and vibrations. **[8]**

Unit – 4

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. **[8]**

Unit – 5

Structural behaviour of footings, Design of isolated footings, combined rectangular and trapezoidal footings by Limit State Method, Design of strap footings.

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of cantilever retaining wall by Limit State Method. **[8]**

References

1. IS: 456 – 2000.

2. Reinforced Concrete Design by S. U. Pillai & D. Menon, Tata Mc.- Graw, New Delhi

3. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.

4. Reinforced Concrete Vol. - II by H.J. Shah, Charotar Publisher, Gujarat.

5. RCC Designs (Reinforced Concrete Structures) by B.C. Punmia, Ashoka Kumar Jain and Arun Kumar Jain, Laxmi Publishers, New Delhi.

6. Reinforced Concrete Structures by R. Park and Pauley.

7. Reinforced Concrete Design by P. Dayaratnam.

8. Reinforced Concrete Design by M.L. Gambhir
9. Reinforced Concrete Design by S.N. Sinha , TMH
10. Plain and Reinforced Concrete Vol. I & II by O.P. Jain & Jai Krishna, Nem Chand & Bros.
11. SP-16: Design Aid to IS- 456.

RCE 602 ENVIRONMENTAL ENGINEERING (L-T-P 3-1-0) Credit - 4

Unit-I

Fresh water, water demands, variation in demands, population forecasting by various methods, basic needs and factors affecting consumption, design period.

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control. **[8]**

Unit-2

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Capacity of distribution reservoirs: general design guidelines for distribution system. **[8]**

Unit-3

Physical, chemical and bacteriological examination of water and wastewater: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. quality requirements, standards of water and waste water, disposal of wastewater on land and water bodies. **[8]**

Unit-4

Objectives of water treatment: unit operations, processes, and flow sheets.

Water treatment: screening, sedimentation, determination of settling velocity, efficiency of ideal sedimentation tank, design of settling tanks, grit chamber.

Primary sedimentation and coagulation, filtration: theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: requirements of an ideal disinfectant; various disinfectants, chlorination and practices of chlorination, water softening and ion-exchange process **[8]**

Unit-5

Objectives of waste water treatment: unit operations, processes, and flow sheets.

Secondary and tertiary treatment: secondary sedimentation and theory of organic matter removal.

Working of activated sludge process, trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, rotating biological contactors (RBC).

Anaerobic digestion of sludge: design of low and high rate anaerobic digesters and septic tank. Working of up flow anaerobic sludge blanket (UASB) reactor and other emerging technologies for wastewater treatment **[8]**

Text Books:

1. Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.
3. M. P. Poonia and SC Sharma: Environmental Engineering, kahnna publishing house
4. Keshav Kant, "Air Pollution Control Engineering", Khanna Publishing House
5. OP Gupta, Elements of Environmental Polluton Control, Khanna Publication
6. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Hammer and Hammer Jr.: Water and Wastewater Technology
6. Raju: Water Supply and Wastewater Engineering
7. Rao: Textbook of Environmental Engineering
8. Davis and Cornwell: Introduction to Environmental Engineering
9. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
10. Punmia: Water Supply and Wastewater Engineering Vol. I and II
11. Birdie: Water Supply and Sanitary Engineering
12. Ramalho: Introduction to Wastewater Treatment Processes
13. Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. A.K. Jain, Environmental Engineering, Khanna Publishing House

RCE 603 TRANSPORTATION ENGINEERING (L-T-P 3-0-0) Credit- 3

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan,

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, **[8]**

UNIT-2

Geometric Design(IRC:73-Latest revision): Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. **[8]**

UNIT-3

Traffic Engineering: Traffic Characteristics, Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, traffic capacity, density, traffic control devices: signs, Island, signal design by Webster's and IRC method . Intersection at grade and grade separated intersections, design of roundabouts as per IRC: 65-2017. Highway capacity and level of service of rural highways and urban roads as per latest IRC recommendation **[8]**

UNIT-4

Highway Materials: Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement : Types of Pavements, Design factors, Design of bituminous paving mixes; Design of Flexible Pavement by CBR method (IRC : 37- Latest revision), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2015) **[8]**

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads. **[8]**

Note: All designs and procedure are to be done with reference to latest revision of IRC as given below in reference section

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.
2. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
3. LR Kadiyali, Transportation Engineering, Khanna Publication.

References:

1. L.R. Kadiyali, Transportation Engineering, Khanna Publishing House
2. Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi
3. Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.
4. Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.

5. Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,
6. IRC : 37- Latest revision, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi
7. IRC:58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Fourth Revision) (with CD)
8. IRC:65-2017 Guidelines for Planning and Design of Roundabouts (First Revision)
9. IRC:73-1980 Geometric Design Standards for Rural (Non-Urban) Highways
10. IRC:106-1990 Guidelines for Capacity of Urban Roads in Plain Areas
11. IRC:93-1985 Guidelines on Design and Installation of Road Traffic Signals.
12. IRC:92-2017 Guidelines for Design of Interchanges in Urban Areas (First Revision)
13. IRC: SP: 68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
14. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
15. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

RCE 061 FOUNDATION DESIGN (L-T-P 3-0-0) Credit – 3

UNIT-1

Introduction to soil exploration, methods of boring and drilling, soil sampling and sampler, in-situ tests, SPT, CPT, DCPT, geophysical methods; soil resistivity methods seismic refraction methods. **[8]**

UNIT-2

Bearing capacity of shallow foundation, design criteria, factors affecting bearing capacity, factors influencing selection of depth of foundation, modes of shear failures, types of shallow foundations, contact pressure under rigid and flexible footings, Terzaghi's, Meyerhof, Hansen's bearing capacity theories, IS code method

Settlement of shallow foundations: components of settlement & its estimation, immediate, consolidation, & differential settlements. **[8]**

UNIT-3

Design of shallow foundation; principles of design of footing, design of isolated footings and strip footing.

Deep foundation; introduction, necessity of deep foundations, pile installation, pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, single and double under reamed piles. **[8]**

UNIT-4

Introduction, shapes and characteristics of wells, components of well foundation, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts.

Retaining walls: introduction, types of retaining structures, support systems for flexible retaining walls (struts, anchoring), construction methods, introduction and uses of sheet piles. **[8]**

UNIT-5

Geotechnical properties of reinforced soil, use of soil reinforcement, shallow foundation on soil with reinforcement, design considerations, idealized soil, foundation and interface behaviour, elastic models of soil behaviour. **[8]**

Reference Books:

1) Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
2) Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
3) Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.
4) Joseph E. Bowles: Foundation analysis and design. McGraw-Hill Higher Education
5) Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
6) Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
7) B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
8) V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Banglore
9) P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
10) I.H. Khan – Text Book of Geotechnical Engineering
11) C. Venkataramaiah – Geotechnical Engineering
12) Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
13) Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 062 INTEGRATED WASTE MANAGEMENT FOR A SMART CITY

(L-T-P 3-0-0) Credit - 3

Unit-1

Introduction: Solid Waste Management- Definition, Concept of 4Rs (reduce, reuse, recycle and recover) of waste management, Elements of a waste management system, Current Issues in Solid Waste Management, Integrated Waste Management Hierarchy: Source reduction, Recycling, Waste-to-Energy and Land filling. Review of waste management under Swachh Bharat Mission and Smart Cities Program. **[8]**

Unit-2

Municipal Solid Waste: Waste Composition and Quantities**,** Collection, Transportation, Segregation, and Processing. **[8]**

Unit-3

Disposal of Municipal Solid Waste: Landfill, Biochemical Processes and Composting, Energy Recovery from Municipal Solid Waste. Municipal Solid Waste (MSW) Rules 2016. **[8]**

Unit-4

Construction and Demolition (C&D) Waste Management: Overview, Components; C&D Waste Management Rules 2016, Beneficial Reuse of C & D Waste Materials. **[8]**

Unit-5

Electronic Waste (E-Waste) Management – Issues and Status in India and Globally, E-Waste Management Rules 2016 and Management Challenges.

Hazardous Wastes: Definition, Classification, Risk assessment, Transportation of hazardous waste, Current Management Practices: Environmental audit, Containment, Remedial alternatives. **[8]**

Books:

1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., *Management of Municipal Solid Waste*, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, *Solid Waste Management*; 2009, PHI.

References:

1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website
3. Construction and Demolition Waste Management Rules, 2016, MoEF&CC
4. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.
5. O P Gupta, " Element of Solid waste hazardous management, Khanna Publishing house.
6. Freeman, M. H.1988. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Book Company, New York
7. http://swachhbharatmission.gov.in/sbmcms/index.htm
8. http://swachhbharaturban.gov.in/

RCE 063 GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

(L-T-P 3-0-0) Credit - 3

UNIT 1

Introduction to Geosynthetics, types of geosynthetics, artificial and natural geosythetics and their applications, manufacture of geosynthetics, strength of reinforced soils, testing of Geosynthetics. **[8]**

UNIT-2

Drainage application of geosynthetics , filtration applications of geosynthetics, erosion control using geosynthetics geosyntheitcs in flexible payment, introduction to geosyenthitcs in landfills, geosynthetics for construction of landfills **[8]**

UNIT-3

Sustainable infrastructure development, different types of soil retaining structures, design codes for reinforced soil retaining walls, construction aspects of geosythetics reinforced soil retaining wall, testing requirements for reinforced soil retaining walls, geosynthetic reinforced soil embankments. **[8]**

UNIT-4

Design of reinforced soil retaining walls – simple geometry, design of reinforced soil retaining walls – sloped backfill soil, soil embankments supported on geocell mattresses, geosynthetic reinforced pile systems for high embankments **[8]**

UNIT-5

Reinforced soil for supporting shallow foundations, response of footings resting on reinforced foundation soils, bearing capacity analysis of footings resting on reinforced foundation soils, carbon footprint analysis **[8]**

REFERENCES

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
3. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.
4. Hoe I. Ling, Guido Gottardi , Daniele Cazzuffi , Jie Han , Fumio Tatsuoka “Design and Practice of Geosynthetic-Reinforced Soil Structures”
5. Sanjay Kumar Shukla, Erol Guler “Advances in Reinforced Soil Structures”

RCE 651 CAD LAB- 2 (L-T-P 0-0-2) Credit - 1

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)

2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.

3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)

RCE 652 ENVIRONMENTAL ENGINEERING LAB (L-T-P 0-0-2) Credit -1

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM10 with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total , suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of a nearby area.

Note: 1. Experiment at S.NO. 14 is mandatory.

2. Any 8 Experiments out of the S.NO 1 to 13 are to be performed.

References:

1. A.P.H.A. “Standard Methods for the Examination of Water andWastewater”, American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. “Chemistry for Environmental Engineering”, Mc-Graw Hill.
3. Mathur, R.P. “Water & Wastewater Testing”, Lab Manual, Roorkee.
4. O P Gupta, Environmental Chemistry, " Khanna Publishing house.

RCE 653 TRANSPORTATION ENGINEERING LAB (L-T-P 0-0-2) Credit - 1

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.

10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
2. Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.
3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

RCE 654 STRUCTURAL DETAILING LAB (L-T-P 0-0-2) Credit - 1

1. Study of SP34/IS13920/IS456:2000 for detailing of structural elements.
2. Preparation of working hand sketches and Auto CAD drawings for the following-
    - RC Beams- Simply supported, Continuous, Cantilever
    - T – beam / L-beam floor
    - Slabs – Simply supported, Continuous, One way and two way slabs.
    - Columns – Tied Columns and Spirally reinforced columns.
    - Isolated footings for RC Columns.
    - Combined rectangular and trapezoidal footings.
3. Preparation of bar bending schedule
4. Detailing of Buildings with respect to Earthquake Resistant Design
5. Study of full set of structural drawing of a building as made available by Institute.

References: Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd., Hyderabad.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

OPEN ELECTIVE-I

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

OPEN ELECTIVE-II

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (*λ*), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial

processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI

6. French, R.H., Open channel Hydraulics, McGraw Hill International

7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of

power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford & Haddow's analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. **2**

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. **8**

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme

technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

(Computer Science and Engineering, Computer Engg. & Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE030, 032 to 037, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
4.	RCS301	Discrete Structures & Theory of Logic	3-0-0	70	20	10	100	3
5.	RCS302	Computer Organization and Architecture	3-0-0	70	20	10	100	3
6.	RCS305	Data Structures	3-1-0	70	20	10	100	4
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	RCS351	Discrete Structure & Logic Lab	0-0-2	50	30	20	100	1
9.	RCS352	Computer Organization Lab	0-0-2	50	30	20	100	1
10.	RCS355	Data Structures Using C/ Java Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE040, 042 to 047, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC405	Introduction to Microprocessor	3-0-0	70	20	10	100	3
4.	RCS401	Operating Systems	3-0-0	70	20	10	100	3
5.	RCS402	Software Engineering	3-0-0	70	20	10	100	3
6.	RCS403	Theory of Automata and Formal Languages	3-1-0	70	20	10	100	4
7.	RCS451	Operating Systems Lab	0-0-2	50	30	20	100	1
8.	RCS452	Software Engineering Lab	0-0-2	50	30	20	100	1
9.	RCS453	TAFL Lab	0-0-2	50	30	20	100	1
10.	RCS454	Python Language Programming Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

RCS301: DISCRETE STRUCTURES & THEORY OF LOGIC

UNIT I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

UNIT II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo n.

UNIT III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.

UNIT IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

UNIT V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill
3. YN Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and SC Ross, “Discrete Mathematical Structures”, PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, “Discrete Mathematics”Oxford Higher Education.
7. Biswal, “Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, “Discrete Mathematics with Graph Theory”, PHI Learning Private Limited, Delhi India.
9. Lipschutz, “Discrete Mathematics”, McGraw Hill
10. Deo N., “Graph Theory with Applications to Engineering and Computer Science”, PHI Learning Private Limited, Delhi India

RCS302: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT II

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

UNIT III

Basic concept and hierarchy, semiconductor RAM memories, 2D & $2\frac{1}{2}D$ memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

UNIT IV

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

UNIT V

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, "Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2nd Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

RCS305/ RCS405: DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

UNIT IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

UNIT V

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.

3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. AK Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

RCS351: DISCRETE STRUCTURE & LOGIC LAB

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

RCS352: COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

RCS355/RCS455: DATA STRUCTURE USING C/ JAVA LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

REC405: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, “Microprocessors and Interfacing”, Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India.
4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, “IBM PC Assembly language and programming”, Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education.

RCS401: OPERATING SYSTEMS

UNIT I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

UNIT II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer/ Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

UNIT III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

UNIT V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

RCS402: SOFTWARE ENGINEERING

UNIT I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, “Software Engineering”, Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

RCS403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

UNIT I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

UNIT II

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. YN Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya, AK "Theory of Computation and Application", BPaperback Publications
6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication.

7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.
10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.

RCS451: OPERATING SYSTEMS LAB

1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS452: SOFTWARE ENGINEERING LAB

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

RCS453: TAFL Lab

Understanding of software like JFLAP for experimenting with formal languages

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

RCS454: PYTHON LANGUAGE PROGRAMMING LAB

Write a Python program to: -

1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
    a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
    Sample String : 'abc'
    Expected Result : 'abcing'
    Sample String : 'string'
    Expected Result : 'stringly'
    b. To get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
6.
    a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
    b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python
Regular Expressions: re modules, match function, search function, modifiers and patterns
Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.
Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions
File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;
Simple Graphics: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.
Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database.
Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; aggregation and composition.

Reference books:

1. John M. Sewart, "Python for Scientist", Cambridge Universities Press.
2. Reema Thareja, "Python Programming" Oxford Higher Education.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python" Pearson
4. Mrak Litz, " Learning Python",O' Reilly
5. Mark Pilgrim, "Dive into Python", Apress
6. James L. Young, "Python made Simple and Practical", Kindle Edition (paperback)
7. Y. Daniel Liang "Introduction to Programming using Python" Pearson

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

For

B. Tech. Third Year

(Computer Science and Engineering)

(Computer Science and Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2018-19)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. Tech. (CSE\CSIT)
FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS501	MANEGERIAL ECONOMICS	3---0---0	70	20	10	100	3
2	RAS502/ RUC501	INDUSTRIAL SOCIOOLOGY /CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-501	Database Management Systems	3---0---0	70	20	10	100	3
4	RCS-502	Design and Analysis of Algorithm	3---1---0	70	20	10	100	4
5	RCS-503	Principles of Programming Languages	3---0---0	70	20	10	100	3
6	CS-Elective-1	DEPTT ELECTIVE COURSE-1	3---1---0	70	20	10	100	4
7	RCS-551	Database Management Systems Lab	0---0---2	50	-	50	100	1
8	RCS-552	Design and Analysis of Algorithm Lab	0---0---2	50	-	50	100	1
9	RCS-553	Principles of Programming Languages Lab	0---0---2	50	-	50	100	1
10	RCS-554	Web Technologies Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

SIXTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS601	INDUSTRIAL MANAGEMENT	3---0---0	70	20	10	100	3
2	RAS602 / RUC601	INDUSTRIAL SOCIOLOGY/ CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-601	Computer Networks	3---0---0	70	20	10	100	3
4	RCS-602	Compiler Design	3---1---0	70	20	10	100	4
5	RCS-603	Computer Graphics	3---0---0	70	20	10	100	3
6	CS-Elective-2	DEPTT ELECTIVE COURSE-2	3---1---0	70	20	10	100	4
7	RCS-651	Computer Networks Lab	0---0---2	50	-	50	100	1
8	RCS-652	Compiler Design Lab	0---0---2	50	-	50	100	1
9	RCS-653	Computer Graphics Lab	0---0---2	50	-	50	100	1
10	RCS-654	Data Warehousing & Data Mining Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

DEPARTMENTAL ELECTIVES

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT

RIT-052: SOFTWARE TESTING & AUDIT

RCS-051: OPERATION RESEARCH

RCS-052: WEB TECHNOLOGIES

CS-ELECTIVE-2: Computer Science Departmental Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS

RIT-062: DATAWAREHOUSING & DATA MINING

RCS-061: INTERNET OF THINGS

RCS-062: NEURAL NETWORK

B. Tech. (CSE\CSIT)
FIFTH EMESTER (DETAILED SYLLABUS)

RCS-501:Database Management Systems		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

References:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-502: Design and Analysis of Algorithm		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**08**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	**08**
III	**Divide and Conquer** with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	**08**
IV	**Dynamic Programming** with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**08**
V	**Selected Topics:** Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms	**08**

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Gajendra Sharma, Design & Analysis of Algorithms, Khanna Publishing House
6. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
7. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
8. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
9. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
10. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
11. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
12. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

RCS-503: Principles of Programming Languages		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Role of Programming Languages: Why Programming Languages, Towards Higher-Level Languages, Programming Paradigms, Programming Environments Language Description: Syntactic Structure, Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models	**08**
II	**Data, Data Types, and Basic Statements** : Names , Variables , Binding, Type Checking, Scope, Scope Rules , Lifetime and Garbage Collection, Primitive Data Types, Strings, Array Types, Associative Arrays ,Record Types, Union Types, Pointers and References , Arithmetic Expressions , Overloaded Operators, Type Conversions , Relational and Boolean Expressions, Assignment Statements, Mixed Mode Assignments, Control Structures, Selection ,Iterations, Branching, Guarded Statements	**08**
III	**Subprograms and Implementations** : Subprograms, Design Issues, Local Referencing, Parameter Passing, Overloaded Methods, Generic Methods, Design Issues for Functions , Semantics of Call and Return, Implementing Simple Subprograms, Stack and Dynamic Local Variables, Nested Subprograms, Dynamic Scoping.	**08**
IV	**Object-Orientation, Concurrency, and Event Handling** : Grouping of Data and Operations — Constructs for Programming Structures, Abstraction Information Hiding, Program Design with Modules, Defined Types, Object Oriented Programming — Concept of Object, Inheritance, Derived Classes and Information Hiding – Templates, Semaphores, Monitors, Message Passing, Threads, Statement Level Concurrency Exception Handling (Using C++ and Java as Example Language).	**08**
V	**Functional and Logic Programming Languages** : Introduction to Lambda Calculus , Fundamentals of Functional Programming Languages, Programming with Programming with ML, Introduction to Logic and Logic Programming – Programming with Prolog.	**08**

References:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal, Fourth ed., Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England
5. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Software Project Planning**: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope Document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project Plan, Structure of a Software Project Management Plan, Software Project Estimation, Estimation Methods, Estimation Models, Decision Process.	**08**
II	**Project Organization and Scheduling Project Elements:** Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts	**08**
III	**Project Monitoring and Control:** Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.	**08**
IV	**Software Quality Assurance and Testing Objectives**: Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & Validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of Correctness, Statistical Quality Assurance, Cleanroom Process.	**08**
V	**Project Management and Project Management Tools Software Configuration Management:** Software Configuration Items and Tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and Risk Types, Risk Breakdown Structure (RBS), Risk Management Process: Risk Identification, Risk Analysis, Risk Planning, Risk Monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.	**08**

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment “A Systems Approach to Planning, Scheduling, and Controlling” Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.
7. P.K. Agarwal, SAM R., Software Project Management, Khanna Publishing House

RIT-052: SOFTWARE TESTING & AUDIT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Review of Software Engineering**: Overview of Software Evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference Between Verification and Validation, Test Cases, Testing Suite, Test ,Oracles, Impracticality of Testing All Data; Impracticality of Testing AllPaths. **Verification:** Verification Methods, SRS Verification, Source Code Reviews, User Documentation Verification, Software, Project Audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection and Configuration Audits.	**08**
II	**Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. **Structural Testing**: Control Flow Testing, Path Testing, Independent Paths, Generation of Graph from Program, Identification of Independent Paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing	**08**
III	**Regression Testing:** What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique. **Reducing the number of test cases**: Prioritization guidelines, Priority category, Scheme, Risk Analysis.	**08**
IV	**Software Testing Activities:** Levels of Testing, Debugging, Testing techniques and their applicability, Exploratory Testing **Automated Test Data Generation:** Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.	**08**
V	**Object Oriented Testing:** Definition, Issues, Class Testing, Object Oriented Integration and System Testing. **Testing Web Applications:** Web Testing, User Interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.	**08**

References:

1 Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012

2. K..K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.

3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.

4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.

5. M.C. Trivedi, Software Testing & Audit, Khanna Publishing House

6. Boris Beizer, “Software System Testing and Quality Assurance”, Van Nostrand Reinhold, New York, 1984.

RCS-051: OPERATION RESEARCH		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	Definition and Scope of Operations Research (OR), OR Model, Solving the OR Model, Art of Modelling, Phases of OR Study. Linear Programming: Two Variable Linear Programming Model and Graphical Method of Solution, Simplex Method, Dual Simplex Method, Special Cases of Linear Programming, Duality, Sensitivity Analysis.	**08**
II	Transportation Problems: Types of Transportation Problems, Mathematical Models, Transportation Algorithms, Assignment: Allocation and Assignment Problems and Models, Processing of Job through Machines.	**08**
III	Network Techniques: Shortest Path Model, Minimum Spanning Tree Problem, Max-Flow Problem and Min-Cost Problem. Project Management: Phases of Project Management, Guidelines for Network Construction, CPM and PERT.	**08**
IV	Theory of Games : Rectangular Games, Minimax Theorem, Graphical Solution of 2 x n or m x 2 Games, Game with Mixed Strategies, Reduction to Linear Programming Model. Quality Systems: Elements of Queuing Model, Generalized Poisson Queuing Model, Single Server Models.	**08**
V	Control: Models of Inventory, Operation of Inventory System, Quantity Discount. Replacement Models: Equipment's that Deteriorate with Time, Equipment's that Fail with Time.	**08**

References:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.
5. T.Veerarajan "Operation Research" Universities Press

RCS-052: WEB TECHNOLOGIES		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking** **:** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	**08**

References:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Tanveer Alam, Internet & Java Programming, Khanna Publishing House
5. Bhave, “Programming with Java”, Pearson Education
6. Herbert Schieldt, “The Complete Reference:Java”, TMH.
7. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
8. Margaret Levine Young, “The Complete Reference Internet”, TMH
9. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
10. Balagurusamy E, “Programming in JAVA”, TMH

RCS-551 Database Management Systems Lab

Objectives :

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
    a)Writing basic SQL SELECT statements.
    b) Restricting and sorting data.
    c)Displaying data from multiple tables.
    d)Aggregating data using group function.
    e)Manipulating data.
    e)Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files

RCS-552 Design and Analysis of Algorithm Lab

Objective:-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Knapsack Problem using Greedy Solution
8. Perform Travelling Salesman Problem
9. Find Minimum Spanning Tree using Kruskal's Algorithm
10. Implement N Queen Problem using Backtracking

RCS-553 Principles of Programming Languages Lab

Objective:-

1. Program for linear search in ML
2. Program for binary search in ML
3. Program for insertion sort in ML
4. Program for bubble sort in ML
5. Program for merge sort in ML
6. Program for Quick sort in ML
7. Program for making a dictionary in ML
8. Program for merging two unsorted-students-name-list in sorted order

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-554 Web Technologies Lab

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
3. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed .
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12. Design and implement a simple shopping cart example with session tracking API.

B. Tech. (CSE\CSIT)
SIXTH EMESTER (DETAILED SYLLABUS)

RCS-601: COMPUTER NETWORKS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling	**08**
II	**Medium Access sub layer:** Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	**08**
III	**Network Layer:** Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	**08**
IV	**Transport Layer**: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	**08**
V	**Application Layer:** Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks	**08**

REFRENCES:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Bhavneet Sidhu, An Integrated approach to Computer Networks, Khanna Publishing House
5. .Gary R.Wright,W.Richard Stevens "TCP/IP Illustrated,Volume2 The Implementation" Addison-Wesley
6. Michael A. Gallo and William M. Hancock "Computer communucation and Networking Technology" Cengage Learning
7. Anuranjan Misra, “Computer Networks”, Acme Learning
8. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

RCS-602: COMPILER DESIGN		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

REFRENCES:

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill,2003.
3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
5. V Raghvan, “ Principles of Compiler Design”, TMH
6. Kenneth Louden,” Compiler Construction”, Cengage Learning.
7. Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education

RCS-603: COMPUTER GRAPHICS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays-Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	**08**
IV	**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
V	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**08**

REFRENCES:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education.
3. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill
4. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – Tata MCGraw Hill.
5. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.
6. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.
7. M.C. Trivedi, NN Jani, Computer Graphics & Animations, Jaico Publications
8 Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
9. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
10. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education

CS-ELECTIVE -2: Computer Science and Engineering Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION:** Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	**08**
II	**BASIC DESIGN:** Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.	**08**
III	**ADVANCED DESIGN:** Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	**08**
IV	**TECHNOLOGY I – ANDROID:** Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-Fi – Integration with social media applications.	**08**
V	**TECHNOLOGY II – iOS:** Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift.	**08**

REFRENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore, apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
6. Development: Exploring the iOS SDK”, Apress, 2013.

RIT-062: DATAWAREHOUSING & DATA MINING		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Data Warehousing:** Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept	**08**
II	**Data Warehouse Process and Technology:** Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,	**08**
III	**Data Mining:** Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	**08**
IV	**Classification**: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods- DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	**08**
V	**Data Visualization and Overall Perspective:** Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	**08**

REFRENCES:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. I. Singh, Data Mining and Warehousing, Khanna Publishing House
4. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
5. Arun K. Pujari, “Data Mining Techniques” Universities Press
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

RCS-061: INTERNET OF THINGS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . **Design Principles for Connected Devices:** IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.	**08**
II	**Hardware for IoT:** Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	**08**
III	**Network & Communication Aspects in IoT:** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**08**
IV	**Programming the Ardunio:** Ardunio platform boards anatomy, ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.	**08**
V	**Challenges in IoT Design Challenges**: Development challenges, Security challenges, Other challenges **IoT Applications** : Smart metering, e-health, city automation, automotive applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	**08**

References:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publicatiosn
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti " Internet of Things(A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,HakinCassimally "Designing the Internet of Things" Wiley India

RCS-062: NEURAL NETWORK		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Neuro Computing and Neuroscience**: Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	**08**
II	**Data Processing Scaling:** Normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perception, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	**08**
III	**Multilayered Network Architecture:** Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	**08**
IV	**Recurrent Network and Temporal Feed-Forward Network:** Implementation with BP, self-Organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing	**08**
V	**Complex Valued NN and Complex Valued BP:** Analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration	**08**

REFRENCES:

1. 1.J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Munesh Chandra Trivedi, NN Jani, Artificial Neural Network Technology, Khanna Publishing House
5. Kosko, Neural Network and Fuzzy Sets, PHI 5. Hagan, Neural Network Design w/CD,Cengage Learning

RCS-651: COMPUTER NETWORKS LAB

1. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
2. Configuration of router, hub, switch etc. (using real devices or simulators)
3. Running and using services/commands like ping, trace route, nslookup, arp, telnet, ftp, etc.
4. Network packet analysis using tools like Wireshark, tcpdump, etc.
5. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
6. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)
7. Programming using raw sockets
8. Programming using RPC

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-652: COMPILER DESIGN LAB

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-653: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6. To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7. To implement Liang Barksy Line Clipping Algorithm.
8. To perform 3D Transformations such as translation, rotation and scaling.
9. To convert between color models.
10. To perform animation using any Animation software
11. To perform basic operations on image using any image editing software
12. To draw different shapes such as hut, face, kite, fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-654: Data Warehousing & Data Mining Lab

It is expected that student should implement concept of Data Mining and Warehousing. The open source Data Mining Tools like Rapid Miner, Weka etc. can be used to implement the concept of Data Mining and Warehousing. Some examples are as follows (Subject Teacher may add more):

1. Implementation of OLAP operations
2. Implementation of Varying Arrays
3. Implementation of Nested Tables
4. Demonstration of any ETL tool
5. Write a program of Apriori algorithm using any programming language.
6. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
7. Demonstration of Association rule process on data-set contact lenses.arff /supermarket (or any other data set) using apriori algorithm.
8. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
9. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
10. Demonstration of clustering rule process on data-set iris.arff using simple k-means.

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course***.**

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** At least 10 problems are to be considered based on corresponding theory course.***

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note:* ***ECS- 088* *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year-IV, Semester-VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	EIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150
3	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
4		IT-Elective-II	3-1-0	30	20	50	100	150
5		IT-Elective-III	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	EIT-751	Cryptography & Network Security Lab*	0-0-2	-	25	25	25	50
7	EIT-752	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
8	EIT-753	Project	0-0-4	-	50	50	-	50
9	EIT-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note: **ECS- 088 may be opted by only those students who didn't opt **EOE-041** as an open elective*

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.
Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation

of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

.

ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.

References:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I

Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:
Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,

Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media
5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, "Real Time Systems", Pearson Education
3. Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:
Neurocomputing and Neuroscience
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft
computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley**.**
4. Upadhyaya, "Mobile Computing", Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III

Image Restoration

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV

Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction

Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects

Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks

Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images

Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus for B.Tech. Second Year

Electronics Engineering / Electronics & Communication Engineering / Electronics & Telecommunication Engineering / Electronics & Instrumentation Engineering / Instrumentation & Control Engineering / Applied Electronics & Control Engineering / Biomedical Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REE305	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
4.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
5.	REC302	Electronic Devices and Circuits	3-1-0	70	20	10	100	4
6.	REC303	Signals & Systems	3-0-0	70	20	10	100	3
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	REC352	Electronic Devices and Circuits Lab	0-0-2	50	30	20	100	1
9.	REC353	Signals & Systems Lab	0-0-2	50	30	20	100	1
10.	REC354	Electronics Workshop & PCB Design Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC401	Microprocessors & Microcontrollers	3-0-0	70	20	10	100	3
4.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
5.	REC403	Electronic Measurement & Instrumentation	3-0-0	70	20	10	100	3
6.	RCS406	Data Structure & Algorithms	3-0-0	70	20	10	100	3
7.	REC451	Microprocessors & Microcontrollers Lab	0-0-2	50	30	20	100	1
8.	REC452	Advanced Electronics System Lab	0-0-2	50	30	20	100	1
9.	REC453	Electronic Measurement & Instrumentation Lab	0-0-2	50	30	20	100	1
10.	RCS456	Data Structure & Algorithms Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REE305: NETWORK ANALYSIS & SYNTHESIS

UNIT I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

UNIT II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

UNIT III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

UNIT IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

UNIT V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. MS Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. ME Van Valkenberg, "Network Analysis", Prentice Hall of India Ltd.
2. Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning Pvt. Ltd

REC301: DIGITAL LOGIC DESIGN

UNIT I

Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

UNIT II

Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III

Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

UNIT V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

REC302: ELECTRONIC DEVICES AND CIRCUITS

UNIT I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

UNIT III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. AS Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, “Electronic Devices and Circuits”, Tata McGraw Hill.
3. BG Streetman and S. Banerjee “Solid State Electronics Devices”, Prentice Hall of India.

Reference Books:

1. Donald A. Neamen “Semiconductor Physics & Devices”, Tata McGraw Hill.
2. Alok K. Dutta, “Semiconductor Devices and Circuits”, Oxford University Press.
3. Jacob Millman and Arvin Grabel, “Microelectronics”, Tata McGraw Hill.

REC303: SIGNALS & SYSTEMS

UNIT I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

UNIT II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems.

UNIT III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

UNIT IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

UNIT V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Book:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals and Systems', Pearson Education.
2. TK Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. BP Lathi, "Principals of Linear Systems and Signals", Oxford University Press.
2. P. Ramakrishna Rao, 'Signal and System', Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, "Probability & Statistics with Reliability Queuing and Computer Science Applications", Wiley Publication.

REC351: DIGITAL LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

REC352: ELECTRONIC DEVICES AND CIRCUITS LAB

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

REC353: SIGNALS & SYSTEMS LAB

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two- and three-dimensional plots.
    b. Write a MATLAB program to plot the following Continuous time and discrete time signals
        1. Step Function
        2. Impulse Function
        3. Exponential Function
        4. Ramp Function
        5. Sine Function
3. Time and Amplitude transformations
    a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
    a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier Series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier Series as a function of time
    c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier Transform of a given signal
    b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
    b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

REC354: ELECTRONICS WORKSHOP & PCB DESIGN LAB

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

RCS406: DATA STRUCTURE & ALGORITHMS

UNIT I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

UNIT III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element, Trees and their applications: C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

UNIT IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

UNIT V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Book:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Reema Theraja, “Data Structure using C”, OUP Publication.

References Books:

1. E. Balagurusamy, “Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. TH Koreman, “Introduction to Algorithms“, MIT Press.

REC401: MICROPROCESSORS & MICROCONTROLLERS

UNIT I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts, Programming using interrupts, Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming.

UNIT III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption.

UNIT IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning.
Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: "A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID.

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publication (India) Pvt. Ltd.
2. DV Hall, "Microprocessors Interfacing", Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880

5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. AK Roy & KM Bhurchandi, “Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)”, Tata McGraw Hill Publication.

REC402: ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate Systems and Transformation :

Basics of Vectors: Addition, subtraction and multiplications**;** Cartesian, Cylindrical, Spherical transformation.

Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form
Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

REC403: ELECTRONIC MEASUREMENT AND INSTRUMENTATION

UNIT I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.

PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

UNIT II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System.

UNIT III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

UNIT IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

UNIT V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers.

Text Book:

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, Tata McGraw Hill Publication.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann).

REC451: MICROPROCESSORS AND MICROCONTROLLERS LAB

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately

   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.

   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.

   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:

   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

   Exercises:

   a) How many Low power modes are supported by the MSP430G2553 platform?

   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises:

   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.

Exercises:

a) Alter the threshold to 75% of Vcc for the LED to turn on.

b) Modify the code to change the Reference Voltage from Vcc to 2.5V.

8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

   Exercises:

   a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?
   b) Create a PWM signal of 75% duty cycle on particular PWM pin.
   c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

   Exercises:

   a) How does the ULP Advisor software help in designing power-optimized code?
   b) Which ULP rule violation helps us to detect a loop counting violation?
   c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

    Exercise:

    Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

    char str1[]="MSP430G2 launchpad"

    char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

    Exercises:

    a) Which port pins of MSP430 can be configured for SPI communication?

    b) What is the data transfer rate supported by MSP430 for SPI communication?

REC452: ADVANCED ELECTRONICS SYSTEM LAB

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
    - *DC biasing of Common Source
    - *MOSFET Common Source Amplifier
    - *MOSFET Source Follower
    - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

- -MOSFET based Ring oscillators
- -MOSFET based Relaxation oscillators
- MOSFET based Voltage-controlled oscillators
- Integration of crystal oscillator into circuits

Data Conversion

- Analog to Digital Conversion
    - * Successive Approximation ADC
- Digital to Analog Conversion
    - * Scaled Resistor Network

System Considerations

- System-level stability: decoupling, ground loops
- Basics of EMC and screening
- Examples of complete electronic systems

REC453: ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

RCS456: DATA STRUCTURE AND ALGORITHMS LAB

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
   a. Searching (Linear Search, Binary Search)
   b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
   c. Merging
4. Implementation of Link List
   a. Creation of Singly link list, Doubly Linked list
   b. Concatenation of Link list
   c. Insertion and Deletion of node in link list
   d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
   a. Array
   b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
   a. Depth First Search
   b. Breadth First Search
   c. Prim`s Algorithm
   d. Kruskal`s Algorithms
9. Implementation of Hash Table

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS
FOR

B. TECH. III YEAR

ELECTRONICS ENGINEERING/ ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS & TELECOMMUNICATION ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]

EVALUATION SCHEME

B.TECH. ELECTRONICS ENGINEERING, B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING, B.TECH. ELECTRONICS & TELECOMMUNICATION ENGINEERING

YEAR 3rd/ SEMESTER V

Sr. No.	Sub Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS501	Managerial Economics	3--0--0	70	20	10	100	3
2	RAS502 /RUC501	Sociology/Cyber Security	3--0--0	70	20	10	100	3
3	REC501A	Integrated Circuits	3--0--0	70	20	10	100	3
4	REC502	Principles of Communication	3--1--0	70	20	10	100	4
5	REC503	Digital Signal Processing	3--0--0	70	20	10	100	3
6	REC051-055	Deptt. Elective Course 1	3--1--0	70	20	10	100	4
7	REC551	Integrated Circuits Lab	0--0--2	50		50	100	1
8	REC552	Communication Lab – I	0--0--2	50		50	100	1
9	REC553	Digital Signal Processing Lab	0--0--2	50		50	100	1
10	REC554	CAD of Electronics Lab-I	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–1

1. **REC051 - Antenna & wave propagation**
2. **REC052 - Computer Architecture and Organization**
3. **REC053- Real Time Systems**
4. **REC054- Artificial Neural Networks**
5. **REC055- Advance Semiconductor devices**

EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering

YEAR 3rd/ SEMESTER VI

Sr. No	Sub Code	Subject Name	L-T-P	Th/LAB Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS601	Industrial Management	3--0--0	70	20	10	100	3
2	RAS602 / RUC601	Sociology /Cyber Security	3--0--0	70	20	10	100	3
3	RIC603	Control System I	3--0--0	70	20	10	100	3
4	REC601	Microwave Engineering	3--1--0	70	20	10	100	4
5	REC602	Digital Communication	3--0--0	70	20	10	100	3
6	REC061 - 065	Deptt. Elective Course 2	3--1--0	70	20	10	100	4
7	REC-651	Microwave Engg Lab	0--0--2	50		50	100	1
8	REC-652	Communication Lab- II	0--0--2	50		50	100	1
9	RIC-653	Control System Lab-I	0--0--2	50		50	100	1
10	RIC-651	Microcontrollers For Embedded Systems Lab	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–2

1. **REC061 - Industrial Electronics**
2. **REC062 - Microcontroller for Embedded Systems**
3. **REC063 - Analog Signal Processing**
4. **REC064 - Advance Digital Design Using Verilog**
5. **REC065- RADAR Engineering**

REC501	INTEGRATED CIRCUITS	
Unit	Topic	Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors. **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design- An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, AnalogMultipliersand their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters Integrated Circuit Timer:** The 555 Circuit, Implementing a Mono stable Multi-vibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Book:

1. Sedra and Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press.
2. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, 2nd Edition.
3. A. K. Maini, Analog Circuits, Khanna Publishing House, Delhi.

Reference Books:

1. Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Edition, Tata McGraw Hill.
2. BehzadRazavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley.
3. Mark N. Horenstein, "Microelectronic Circuits and Devices", PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

REC502	PRINCIPLES OF COMMUNICATION	
Unit	Topic	Lectures
I	Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.	7
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy	9
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill.
2. Rishabh Anand, Communication Systems, Khanna Publishing House, Delhi

Reference Books:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

REC503	DIGITAL SIGNAL PROCESSING	
Unit	Topics	Lectures
I	Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization, FIR Filter Realization: Direct & Cascade, FIR Linear Phase Realization.	8
II	Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and ChebyshevFilters, Frequency Transformations.	8
III	Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window, Finite Word length effects in digital filters.	8
IV	DFT & FFT: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution using Circular Convolution, Decimation in Time (DIT) Algorithm, Decimation in Frequency (DIF) Algorithm.	8
V	Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion: Single and Multistage, SubbandCoding of Speech signals, Quadrature mirror filters.	8

Text Book:

1. Johnny R. Johnson, .Digital Signal Processing., PHI Learning Pvt Ltd., 2009.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, .Digital Signal Processing. Pearson Education.
2. Oppenheim & Schafer, . Digital Signal Processing. PHI

LABORATORY

REC551 INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of thecircuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for-
    - **a)** Low pass filter of specified cut off frequency.
    - **b)** High pass filter of specified frequency.
    - **c)** Band pass filter with unit gain of specified pass band
    - **d)** Design a notch filter to eliminate 50Hz power line frequency.
4. Wien bridge oscillator using operational amplifier.
5. Astable and mono-stable multivibrators using IC 555.
6. Design the following amplifiers:
    - **a)** A unity gain amplifier.
    - **b)** A non-inverting amplifier with a gain of "A".
    - **c)** An inverting amplifier with a gain of "A".
    - **d)** Log and antilog amplifiers.
    - **e)** Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency „f". Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC.

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

REC552 **COMMUNICATION LAB-I**

List of Experiments

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation.
    a) using switching method
    b) by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To study Pulse code modulation and demodulation technique.
11. To study Delta modulation and demodulation technique.
12. Design and implement an FM radio receiver in 88-108 MHz

REC553 **DIGITAL SIGNAL PROCESSING LAB**

List of Experiments

1. To study about DSP Processors and architecture of TMS320C6713 DSP processor.
2. Introduction to MATLAB and Code Composer Studio or its equivalent open source software.
   OR
   Introduction to Scilab Open Source Software (Using Spoken Tutorial MOOCs)
3. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
4. To study matrix multiplication using code composer studio.
5. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.
6. To implement FFT algorithm.
7. Verify Blackman and Hamming windowing techniques.
8. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
9. Verify Circular Convolution using code composer studio.
10. Verify Linear convolution of two sequence using code composer studio.
11. To implement Tone Generation.
12. To implement floating point arithmetic.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

REC554CAD OF ELECTRONICS LAB- I

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient &DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.
6. Design and Simulation of a Differential Amplifier (with Resistive Load, Current Source Biasing)
7. Analysis of frequency response of Common Source amplifiers.
8. Analysis of frequency response of Source Follower amplifiers.
9. Analysis of frequency response of Cascode amplifiers.
10. Analysis of frequency response of Differential amplifiers.

DEPARTMENTAL ELECTIVE COURSE 1

REC051	ANTENNA AND WAVE PROPAGATION	
Unit	Topic	Lectures
I	Antennas Basics:Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	5
II	Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non-uniform Amplitude Distributions. General Considerations.	8
III	Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	8
IV	The Loop Antenna:Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. Reflector Antennas: Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	9
V	Ground Wave Propagation: Plane Earth Reflection, Space Wave and Surface Wave. Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. Sky wave Propagation**:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	10

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, “Antennas and Wave Propagation”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. A. R. Harish, M. Sachidananda, “Antennas and Wave Propogation”, Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
3. R.L. Yadava, Electromagnetic Waves, Khanna Publishing House, Delhi.
4. A. Das, Sisir K. Das, “Microwave Engineering”, Tata McGraw Hill.

REC052	Computer Architecture and Organization	
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8
III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.
4. I. Singh, Computer Organisation and Architecture, Khanna Publishing House, Delhi

REC053	REAL TIME SYSTEMS	
Units	**Topic**	**Lectures**
I	**Introduction to Real Time** System Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8
II	**Embedded Hardware for Real Time** System Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware** – On chip Peripherals and Communication protocols Role of peripherals for Real time systems, On-Chip peripherals& hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI &UART. Introduction to the CCS IDE: its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. Programming: demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, "DSP based Electromechanical Motion Control" CRC Press Publication.
4. Jean J Labrosse, "Embedded System Design blocks", CMP books Publication
5. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication

REC054	Artificial Neural Network	
Unit	**Topic**	**Lectures**
I	**Introduction to ANN:** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8
IV	**a)Feedforward neural networks** -- Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran ,VijayalakshmiPari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

REC055	ADVANCE SEMICONDUCTOR DEVICES	
Unit	Topics	Lectures
I	Physics of Semiconductors, P-N Junction Diode and BJT: Introduction, Crystal Structure, Phonon, Optical, and Thermal Properties,*p-n* Junctions –Junction Breakdown, Transient Behavior and Noise Terminal Functions.BJT:Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor.	8
II	MOSFET, Hetero-Junctions and Basics of Nanostructures: MOSFET: Basic Device Characteristics, Nonuniform Doping and Buried Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Single Electron Transistor, JFETs. Hetero-junctions:Metal-Semiconductor Contacts, Metal-Insulator-Semiconductor Capacitors. MESFETs and MODFETs. Nanostructures: Basic Equations and Examples.	8
III	TUNNEL Devices and IMPATT Diodes: TUNNEL DEVICES:Tunnel Diode, Related Tunnel Devices, Resonant Tunneling Diode. IMPATT Diodes: Static Characteristics, Dynamic Characteristics, Power and Efficiency Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode	8
IV	Power devices, Photonic devices:Transferred-Electron and Real-Space-Transfer Devices Thyristors, Power Devices. Photonic Devices and Sensors: Radiative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers	8
V	Photodetectors, Solar Cells and Sensors:Photodiodes, Avalanche Photodiode and Phototransistor, Charge-Coupled Device (CCD), Metal- Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell Sensors: Thermal Sensor, Mechanical Sensors, Magnetic Sensors and Chemical Sensors	8

Text Book:

1. S. M. Sze, Kwok K. NG, “Physics of Semiconductor Devices”, 3rd Edition, Wiley Publication

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics Of Semiconductor Devices", Kluwer Academic Publishers
2. B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.
3. SupriyoDatta, “Quantum Transport Atom to Transistor”, Cambridge University Press, 2005
4. A.K. Maini, All in One Electronics Simplified, Khanna Publishing House, Delhi

RIC603 CONTROL SYSTEM-I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems, Analogous Systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability, Eigen Value and Eigen Vector, Diagonalization.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci.	8
V	Frequency Domain Analysis: Mr (resonant peak) and ωr (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Polar Plot, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with the Bode plot.	8

Text Book:

1. B.C. Kuo&FaridGolnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. I. J. Nagrath& M. Gopal, "Control System Engineering", New Age International Publishers
2. A. Ambikapathy, Control Systems, Khanna Publishing House, Delhi.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rdEdition, Tata McGraw Hill, Special Indian Edition 2010.
3. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.

REC601	MICROWAVE ENGINEERING	
Unit	**Topics**	**Lectures**
I	**Rectangular & circular waveguides:Introduction to microwave communication and EM spectrum**, Rectangular wave guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular waveguides: TE, TM modes. Wave velocities, Microstrip transmission line (TL), Coupled TL, Strip TL, Coupled strip line, Coplanar TL, Microwave cavities	11
II	**Passive microwave devices:** Scattering matrix, Passive microwave devices: Microwave hybrid circuits, Terminations, Attenuators, Phase Shifters, Directional couplers: Two-hole directional couplers, S- Matrix of a directional coupler, Hybrid couplers, Microwave propagation in ferrites, Faraday rotation, Isolators, Circulators. S-parameter analysis of all components.	10
III	**Microwave tubes :**Microwave tubes: Limitations of conventional active devices at microwave frequency, Two cavity Klystron, Reflex Klystron, Magnetron, Traveling wave tube, Backward wave oscillators, Gyro Devices: Their schematic, Principle of operation, Performance characteristic and their applications.	7
IV	**Solid state amplifiers and oscillators:** Transferred electron devices: Gunn-effect diodes & modes of operation. Avalanche transit – time devices: IMPATT diode, TRAPPAT diode, BARITT diode.	5
V	**Microwave Measurements:** VSWR meter, Frequency meter, Spectrum analyser, Network analyser,Tunable detector, Slotted line carriage, Power meter, Microwave power measurement, Insertion loss and attenuation measurement, VSWR measurement, Return loss measurement by a reflectometer, Frequency measurement, measurement of cavity Q, Dielectric constant measurement of a solid, EM radiation & measurement.	7

Text Books:

1. G. S. Raghuvanshi, Microwave Engineering; Cengage
2. S.Y. Liao, Microwave Devices & Circuits; PHI 3rd Ed.

Reference Books:

1. A Das and S.K. Das, Microwave Engineering; McGraw Hill Education
2. S. Vasuki, D Margaret Helena, R Rajeswari, Microwave Engineering; MHE
3. M.I. Skolnik, Introduction to Radar Engineering ; TMH
4. Om P. Gandhi, Microwave Engineering and Applications; Pergamon Press

REC602	DIGITAL COMMUNICATION	
Unit	**Topic**	**Lectures**
I	Principles of digital data transmission: Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system. Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation.	08
II	Fundamentals of probability theory & random process : Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes Power spectral density, Multiple random Processes.	08
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers	08
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications Introduction to information theory: Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel. Capacity of a discrete and Continuous Memory less channel.	08
V	Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability Linear block codes: encoding and syndrome decoding. Cyclic codes: encoder and decoder for systematic cyclic codes. Convolution codes, code tree and Trellis diagram, Viterbi and sequential decoding, Burst error correction, Turbo codes.	08

Text Book:

1. B.P. Lathi, “Modern Digital and Analog communication Systems”, 4th Edition, Oxford University Press, 2010.
2. RishabhAnand, Communication Systems, Khanna Publishing House, Delhi.

Reference Books:

1. H. Taub, D L Schilling, GautamSaha, “Principles of Communication”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. John G. Proakis, “Digital Communications”, 4th Edition, McGraw-Hill International.
3. Simon Haykin, “Communication Systems”, 4th Edition, Wiley India.
4. H P HSU & D Mitra, “Analog and Digital Communications”, 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

LABORATORY

REC651 **MICROWAVE ENGINEERING LAB**

List of Experiments

1. To study microwave test bench.
2. To study the characteristics of reflex klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE_{01} mode.
4. To study measurement of reflection coefficient and standing wave ratio using double minima method.
5. To study V-I characteristic of Gunn diode.
6. To measure an unknown impedance with Smith chart.
7. Study of Circulator/Isolator.
8. Study of Attenuator (Fixed and Variable type).
9. To study simple dipole $\lambda/2$ antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
10. To study folded dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
11. To study $\lambda/2$ phase array end-fire antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
12. To study broadside array antenna and to calculate beam-width, front / back ratio, and gain of the antenna.

REC652 **COMMUNICATION LAB – II**

List of Experiments

1. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component
2. Study of pulse data coding & decoding techniques for NRZ and RZ formats.
3. Study of Manchester coding and Decoding.
4. Study of Amplitude shift keying modulator and demodulator.
5. Study of Frequency shift keying modulator and demodulator.
6. Study of Phase shift keying modulator and demodulator.
7. Study of single bit error detection and correction using Hamming code.
8. Study of Quadrature Phase shift keying modulator and demodulator.
9. To simulate Differential Phase shift keying technique using MATLAB software.
10. To simulate M-ary Phase shift keying technique using MATLAB software (example8PSK, 16PSK) and perform BER calculations.
11. To simulate convolutional coding using MATLAB software.
12. Design a front end BPSK modulator and demodulator.

RIC653CONTROL SYSTEM LAB-I

List of Experiments:

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolboxor its equivalent open source freeware software like Scilabusing Spoken Tutorial MOOCs.
2. Determine transpose, inverse values of given matrix.
3. Plot the pole-zero configuration in s-plane for the given transfer function.
4. Determine the transfer function for given closed loop system in block diagram representation.
5. Plot unit step response of given transfer function and find delay time, rise time, peak time and peak overshoot.
6. Determine the time response of the given system subjected to any arbitrary input.
7. Plot root locus of given transfer function, locate closed loop poles for different values of k. Also find out Wd and Wnat for a given root.
8. Create the state space model of a linear continuous system.
9. Determine the State Space representation of the given transfer function.
10. Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.
11. Determine the steady state errors of a given transfer function.
12. Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

RIC651 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

DEPARTMENTAL ELECTIVE COURSE 2

REC061	INDUSTRIAL ELECTRONICS	
Unit	Topics	Lectures
I	**Power Semiconductor Devices**: Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	8
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters**: Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, stepup/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. Control of D.C. Drives: Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	8
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	8
V	Protection of device and circuits: Introduction, Cooling and heat sinks, Thermal Modeling of Power Switching devices, Snubber Circuits, Reverse Recovery Transients, Supply- and Load- side Transients, Voltage Protection, Current Protections, Electromagnetic Interference.	8

Text Books:

1. M. H. Rashid, “Power Electronics”, 3rd Edition, Pearson Education.
2. M. D. Singh & K. Khanchandani, “Power Electronics”, Tata McGraw Hill.

Reference Books:

1. V.R. Moorthy, “Power Electronics: Devices, Circuits and Industrial Applications”, Oxford University Press,2007.
2. M.S. JamilAsghar, “Power Electronics”,PHI.
3. Chakrabarti&Rai, “Fundamentals of Power Electronics &Drives”DhanpatRai& Sons.
4. Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics:Converters, Applications and Design”, Wiley India.
5. S.N.Singh, “A Text Book of Power Electronics”,DhanpatRai& Sons.

REC602 MICROCONTROLLER FOR EMBEDDED SYSTEMS		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlayRolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

REC063	ANALOG SIGNAL PROCESSING	
Unit	Topics	Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. Second-order filter realization, filter design parameters (Q and ω_0), frequency response, Three op-amp biquad, effect of finite gain of op-amp over filters, Sallen-Key biquad.	10
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications, comparison of Maximally flat and Equal ripple responses.	8
III	Delay equalization: equalization procedures, equalization with first-order and second order modules, strategies for equalization design. Definition of Bode sensitivity.	7
IV	The General Impedance Convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8
V	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, Gyrator, First and second order filters, Higher order filters	**7**

Text Book:

1. R. Schaumann and M.E. Valkenberg,"Design of Analog Circuits", Oxford University Press

REC064	ADVANCED DIGITAL DESIGN USING VERILOG	
Unit	**Topic**	**Lectures**
I	ntroduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Introduction to Verilog, Behavioral and Structural specification of logic circuits, Boolean function implementation using Verilog, Timing Analysis, Hazard Detection and Elimination	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous StateMachines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi-levelminimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis incombinational and sequential systems, Path Sensitization method, Boolean DifferenceMethod, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures,Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Richard F. Tinder, "Engineering Digital Design", Academic Press.
2. Parag K. Lala, "Digital system Design Using PLDs", PHI India Ltd.
3. Stephen Brown and ZvonkoVranesiv, "Fundamental of Digital Logic with Verilog Design", Tata McGraw Hill.

Reference Books:

1. John Williams, "Digital VLSI Design with Verilog", Springer Publication.
2. Eugene Fabricius, "Modern Digital Design and Switching Theory", CRC Press.
3. Samuel C. Lee, "Digital Circuit and Logic Design", PHI India Ltd.
4. Alexander Miczo, "Digital Logic Testing and Simulation",WileyInterscience.

REC065RADAR ENGINEERING

Unit	Topics	Lectures
I	**Introduction to Radar:** Basic radar, The simple form of radar equation, Radar block diagram, Radar frequencies, Applications to radar.	5
II	**Radar Equation:** Introduction, Detection of signal in noise, Receiver noise and the signal to noise ratio, Probability density functions, Probabilities of detection and false alarm, Integration of Radar pluses, Radar cross section of targets, Radar cross section fluctuations, Transmitter power, Pulse repetition frequency, antenna parameters, system losses, Other Radar equation considerations.	9
III	**MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI Radar, Delay-Line cancelers, Staggered pulse repetition frequencies, Doppler filter banks, Digital MTI processing, Moving target detector, Limitation of MTI performance, MTI from a moving platform, Pulse Doppler Radar, CW Radar.	9
IV	**Tracking Radar:** Tracking with Radar, Mono-pulse tracking, Conical scan and sequential lobbing, Limitation to tracking accuracy, Low-angle tracking, Tracking in range, Comparison of trackers, Automatic tracking with Surveillance Radar (ADT)	8
V	**Information from Radar signals:** Basic Radar measurements, Ambiguity diagram, Pulse compression, Target recognition. **Radar Clutter:** Land clutter, Sea clutter, Weather clutter and detection of targets in clutter.	9

Text Book:

1. Merrill I. Skolnik“ Introduction to Radar Systems” Third Edition.

Reference Book:

1 J.C. Toomay , Paul J. Hannen “ Principles of Radar” Third Edition.
2 GottapuSasibhusanaRao, “Microwave and Radar Engineering, Pearson.
3 Bernard Davis,George Kennedy, Electronic Communication Systems, Tata McGraw-Hill Education Pvt. Ltd.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins," Carrier-Grade VoIP", McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, "IP Telephony – Deploying Voice Over-IP Protocols", John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

NEC 041 ELECTRONIC SWITCHING		3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication Switching Systems and Networks", PHI.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus
For
B.Tech. Second Year
(Mechanical Engineering/ Production Engineering, Industrial & Production Engineering, Mechanical & Industrial Engineering, Manufacturing Technology, Automobile Engineering, Aeronautical Engineering)
On
Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	Th/Lab ESE	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE031 to 036, 038, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
4.	RME301	Material Science	3-0-0	70	20	10	100	3
5.	RME302	Thermodynamics	3-1-0	70	20	10	100	4
6.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
7.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
8.	RME351	Material Science & Testing Lab	0-0-2	50	30	20	100	1
9.	RME352	Thermodynamics Lab	0-0-2	50	30	20	100	1
10.	RME353	Computer Aided Machine Drawing–I Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE041 to 046, 048, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REE409	Electrical Machines & Controls	3-0-0	70	20	10	100	3
4.	RME401	Measurement and Metrology	3-0-0	70	20	10	100	3
5.	RME402	Manufacturing Science & Technology-I	3-0-0	70	20	10	100	3
6.	RME403	Applied Thermodynamics	3-1-0	70	20	10	100	4
7.	REE459	Electrical Machines and Controls Lab	0-0-2	50	30	20	100	1
8.	RME451	Measurement and Metrology Lab	0-0-2	50	30	20	100	1
9.	RME452	Manufacturing Science & Technology–I Lab	0-0-2	50	30	20	100	1
10.	RME453	Computer Aided Machine Drawing-II Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

NOTE: Practical summer training-1 of 4-weeks after IV semester or Minor fabrication project will be evaluated in VII semester.

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

RME301: MATERIAL SCIENCE

UNIT I

Introduction: Importance of materials, historical perspective, Future aspects of engg. materials.

Crystal Structure: brief on BCC, FCC and HCP Structures, coordination number and atomic packing factors. Bravais lattices, Miller indices, crystal imperfections-point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

Ferrous and non- ferrous materials: Properties, Composition and uses of Grey cast iron, malleable iron, SG iron and steel, copper alloys-brasses and bronzes, Aluminium alloys. Introduction to BIS & ASTM codes and practice on material and testing.

UNIT II

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, mechanical properties in plastic range, yield strength off set yield strength, ductility, ultimate tensile strength, toughness, Plastic deformation of single crystal by slip and twinning, Hardness Tests.

Fracture Creep Fatigue: Fracture: Type I, Type II and Type III. Creep: Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation. Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

UNIT III

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures. Phase Diagram I: Solid solutions Hume Rothary rule, substitutional and interstitial solid solutions, intermediate phases, Gibbs phase rule.

Phase Diagram: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

UNIT IV

Heat Treating of Metals: TTT curves, continuous cooling curves, annealing and its types. Normalizing, hardening, tempering, mastempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

Comparative study of microstructure of various Ferrous, nonferrous metals and alloys.

UNIT V

Composite materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

Ceramics: Structure types and properties and applications of ceramics. Mechanical/ Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/ plastics and its applications. Mechanical behaviour and processing of plastics, Future of plastics. Introduction to Smart materials & Nano-materials and their potential applications.

Books and References:

1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.

2. Elements of Material Science & Engineering by Van Vlack, Pearson
3. Material Science and Engineering by Smith, Hashemi and Prakash, MCGRAW HILL INDIA
4. The Science and Engineering of materials, by Askeland & Balani, Cengage Learning
5. Introduction to Materials Science for Engineers by Shackelford, Pearson
6. Material Science by Narula, MCGRAW HILL INDIA.
7. Materials Science and Engineering - A First Course by Raghavan, PHI
8. Material Science and Engineering Properties by Gilmore, Cengage Learning
9. Material Science for Engineering Students by Fischer, Academic Press
10. Technology of Engineering materials by Philip and Bolton, Butterworth-Heinamann

RME302: THERMODYNAMICS

UNIT I

Review of Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases. **Zeroth law of thermodynamics:** Concept of Temperature and its' measurement, Temperature scales.

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

UNIT II

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Mollier chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

Air-water vapour mixture and Psychrometry: Psychometric terms and their definitions, Psychometric chart, Different Psychometric processes and their representation on Psychometric chart.

UNIT V

Refrigeration Cycles: Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration.Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system.

Books and References:

1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.
6. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
7. Engineering Thermodynamics by Dhar, Elsevier.
8. Engineering Thermodynamics by Onkar Singh, New Age International.
9. Engineering Thermodynamics by CP Arora.
10. Engineering Thermodynamics by Rogers, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Engineering Thermodynamics by Mishra, Cengage Learning
13. Refrigeration and Air Conditioning by C P Arora, MCGRAW HILL INDIA

RME303: MECHANICS OF SOLIDS

UNIT I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure. Thermal Stresses.

UNIT II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams
Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

UNIT III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.
Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

UNIT IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.
Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

UNIT V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.
Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Yσungs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Material by Rattan, MCGRAW HILL INDIA
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

RME351: MATERIALS SCIENCE AND TESTING LAB

In this lab Experiments on Material Science and Experiments on Material Testing are to be conducted as given below:

(A). Experiments on Material Science (at least 5 of the following):

1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & micro examination of the welded specimen.
10. Study of Magnetic/ Electrical/Electronic materials.

(B) Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

RME352: THERMODYNAMICS LAB

Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance sheet for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment(s) on thermodynamics

RME353: COMPUTER AIDED MACHINE DRAWING-I LAB

Introduction (1 drawing sheets)
Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

Orthographic Projections (3 drawing sheets)
Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

Fasteners (2 drawing sheets)
Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

Riveted joints (1 drawing sheet)
Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

Assembly drawing (2 drawing sheets)
Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

Free hand sketching (1 drawing sheet**)**
Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

Computer aided drafting (1 drawing**)**
Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

REE409: ELECTRICAL MACHINES & CONTROLS

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests. **Three Phase Transformer:** Three phase transformer connections, 3-phase to 2-phase or 6-phase connections and their applications. **Auto Transformer:** Volt- Amp relations, efficiency, advantages & disadvantages, applications. **D.C. Motors:** Concept of starting, speed control, losses and efficiency.

UNIT II

Three phase Induction Motor: Construction, equivalent circuit, torque equation and torque-slip characteristics, speed control. **Alternator:** Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. **Synchronous Motor:** Starting, effect of excitation on line current (V-curves), synchronous condenser. **Servo Motor:** Two phase A.C. servo motor & its application.

UNIT III

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, electrical analog of simple mechanical systems; concept of transfer function & its determination for simple systems. **Control System:** Open loop & closed loop controls, servo mechanisms; concept of various types of system. **Signals:** Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics**.**

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants. **Stability:** Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations; Polar plot, Nyquist stability Criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. **Frequency Response Analysis:** Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots. **Process control:** Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text and Reference Books:

1. IJ Nagrath & D. P. Kothari, “Electrical machines” Tata McGraw Hill.
2. BR Gupta & Vandana Singhal, “Fundamentals of Electrical Machines”, New Age International.
3. K. Ogata, “Modern Control Engineering” Prentice Hall of India.
4. BC Kuo, “Automatic Control systems.” Wiley India Ltd.
5. Irvin L. Kosow, “Electric Machinery and Transformers” Prentice Hall of India.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, Control Systems: Principles and Design” Tata McGraw Hill.

RME401: MEASUREMENT AND METROLOGY

UNIT I

Mechanical Measurements: Introduction to measurement and measuring instruments. General concept–Generalized measurement system and its elements-Unit sand standards-measuring instruments: sensitivity, stability, range, accuracy and precision-static and dynamic response- repeatability-systematic, Source of error, statistical analysis of error and random errors- correction, calibration. Dimensional and geometric tolerance

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

UNIT II

Time Related Measurements: Stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

UNIT III

Flow Measurement: Hot Wire Anemometry, Laser Doppler Velocimetry, Rotameter

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Measurements of Force, Torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments

Measurements of Acceleration, and Vibration: Accelerometers vibration pickups and decibel meters, vibrometers.

UNIT IV

Coordinate measuring machine (CMM): Need, constructional features and types,

Metrology and Inspection: Standards of linear measurement, line and end standards. Interchange ability and standardization. Linear and angular measurements devices and systems **Comparators:** Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design.

UNIT-V

Limits, Fits &Tolerance and Surface roughness: Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness. Measurement of geometric forms like straightness, flatness, roundness. Tool makers microscope, profile projector, autocollimator.

Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:

1. Experimental Methods for Engineers by Holman, MCGRAW HILL INDIA
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, MCGRAW HILL INDIA
5. Measurement Systems, Application Design by Doeblein, MCGRAW HILL INDIA
6. Hume KJ, "Engineering Metrology", MacDonald and Co
7. Jain, RK, "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers
9. Gupta SC, Engineering Metrology, Dhanpat Rai Publications

RME402: MANUFACTURING SCIENCE & TECHNOLOGY-I

UNIT I

Introduction: Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items. **Metal Forming Processes**: Elastic & plastic deformation, yield criteria (Mises' and Tresca's). Hot working versus cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.

UNIT II

Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. Design, lubrication and defects in metal forming processes.

UNIT III

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load (capacity) needed. Analysis of forming process like cup/deep drawing. Bending & spring-back.

UNIT IV

Casting (Foundry): Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting, Sand casting, defects & remedies and inspection. Cupola furnace. Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO_2 casting and Stir casting etc.

UNIT V

Unconventional Metal forming processes: Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming. **Powder Metallurgy**: Introduction to Powder metallurgy manufacturing process. Application and, advantages. **Jigs & Fixtures**: Locating & Clamping devices & principles. Jigs and Fixtures and its applications. **Manufacturing of Plastic components**: Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by PC Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA
5. Manufacturing Processes by Lindberg, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson
7. Materials and Manufacturing by Paul Degarmo.
8. Manufacturing Processes by Kaushish, PHI
9. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
10. Production Technology by RK Jain

EME403: APPLIED THERMODYNAMICS

UNIT I

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

UNIT II

Vapour Power cycles: Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, MCGRAW HILL INDIA
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI
5. Theory of Stream Turbine by WJ Kearton

6. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Steam & Gas Turbine by R. Yadav, CPH Allahabad
9. Thermodynamics and Energy Systems Analysis, Borel and Favrat, CRC Press
10. Thermodynamics by Prasanna Kumar, Pearson
11. Thermal Engineering by Kulshrestha, Vikas Publishing.
12. Thermal Engg. By PL Ballaney, Khanna Publisher
13. Thermal Engg. By RK Rajput, Laxmi Publication

REE459: ELECTRICAL MACHINES & CONTROLS LAB

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Control Systems

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To obtain 3-phase to 2-phase conversion using Scott connection.
7. To perform load test on a 3-phase induction motor and determine (a) speed- torque characteristics (b) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Control Systems:

1. To determine transient response of a second order system for step input for various values of constant ‘K’ using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an a.c. 2-phase servo motor.
4. To study and calibrate temperature using Resistance Temperature Detector(RTD)
5. To study dc servo position control system within P and PI configurations.
6. To study synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

RME451:MEASUREMENT & METROLOGY LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sine bar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. Experiment on measurement of pressure.
11. Study of temperature measuring equipments.
12. Measurement using Strain gauge.
13. Measurement of speed using stroboscope.
14. Experiment on measurement of flow.
15. Measurement of vibration/power.
16. Experiment on dynamometers.
17 To study the displacement using LVDT.

RME452 :MANUFACTURING TECHNOLOGY-I LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

RME453: COMPUTER AIDED MACHINE DRAWING-II LAB

Note: All drawing conform to BIS Codes.

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts. List of Standard Abbreviation used.

Part Modeling: Introduction to part modeling of simple machine components using any 3D software (like CATIA, PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model ***(Minimum 24 machine components need to be developed).***

Part Modeling & Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing by K.R. Gopalakrishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria & Sons
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age publications
5. Engineering Graphics with AutoCAD, Bethune, PHI
6. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley

Dr. A.P.J. Abdul Kalam Technical UniversityUttar Pradesh,Lucknow

Syllabus

for

B. Tech. Mechanical Engineering

Third Year

(Effective from the Session: 2018-19)

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS501	Managerial Economics	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	Sociology /Cyber Security	Applied Science	3--0--0	70	20	10	100	3
3	RME501	Machine Design-I	Core Deptt.	3--0--0	70	20	10	100	3
4	RME502	Heat & Mass Transfer	Core Deptt.	3--1--0	70	20	10	100	4
5	RME503	Manufacturing Science& Technology-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME051-054	Deptt. Elective Course-1	Core Deptt.	3--1--0	70	20	10	100	4
7	RME551	Design and Simulation Lab I	Core Deptt.	0--0--2	50		50	100	1
8	RME552	Heat & Mass Transfer Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME553	Manufacturing Technology-II Lab	Core Deptt.	0--0--2	50		50	100	1
10	RME559	Seminar – I		0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-1

1. **RME-051 IC Engines and Compressors**
2. **RME-052 Mechatronics and Microprocessor**
3. **RME-053 Finite Element Methods**
4. **RME-054 Engineering Optimization**

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-VI

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS601	Industrial Management	Applied Science	3--0--0	70	20	10	100	3
2	RUC601/ RAS602	Cyber Security/ Sociology	Applied Science	3--0--0	70	20	10	100	3
3	RME601	Fluid Machinery	Core Deptt.	3--0--0	70	20	10	100	3
4	RME602	Theory of Machines	Core Deptt.	3--1--0	70	20	10	100	4
5	RME603	Machine Design-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME061-064	Deptt. Elective Course-2	Core Deptt.	3--1--0	70	20	10	100	4
7	RME651	Fluid Machinery Lab	Core Deptt.	0--0--2	50		50	100	1
8	RME652	Theory of Machines Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME653	Design and Simulation Lab II	Core Deptt.	0--0--2	50		50	100	1
10	RME654	Refrigeration & Air-conditioning	Core Deptt.	0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-2

1. **RME061 Refrigeration & Air-conditioning**
2. **RME062 Production Planning and Control**
3. **RME063 Mechanical Vibration**
4. **RME064 Reliability Engineering**

MACHINE DESIGN-I **L T P**
3 0 0

8

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II

8

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor,Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III

8

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

UNIT IV

8

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

UNIT V

8

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.

3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1
Introduction to Heat Transfer:
Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :
General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :
Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2 Fins:
Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:
Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

UNIT-3
Forced Convection:
Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :
Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

5

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 0 0

Unit I
Metal Cutting-
Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Dynamometer, Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

9

Unit-II
Machine Tools
(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III
Grinding & Super finishing
(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:
Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV
B. Metal Joining (Welding)
Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds andremedies. Weld decay in HAZ

10

Unit-V
C. Introduction to Unconventional Machining and Welding
Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma- arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.

4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

DepartmentalElective Course-1

I C ENGINES & COMPRESSORS

L T P
3 1 0

Unit-1
Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.
Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles
Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II
SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.
Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine
Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III
CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.
Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings
Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV
Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.
Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.
Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V
Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.
Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:
1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

MECHATRONICS AND MICROPROCESSOR **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semiconductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semiconductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, "Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, "Introduction to Mechatronics & Measurement Systems, 4e", McGraw-Hill Education, 2014.
3. M Jouaneh, "Fundamentals of Mechatronics", Cengage Learning, 2013.
4. W. Bolton, "Mechatronics", Pearson Education, Second Edition, 1999.
5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, "Mechatronics", Chapman and Hall, 1993.
6. Dan Necsulesu, "Mechatronics", Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, "Mechatronics", McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, "Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics", Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. "Mechatronics: Integrated Mechanical Electronic Systems", Wiley

FINITE ELEMENT METHODS **L T P**

3 1 0

Unit 1

Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.

Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II

Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III

Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV

Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials. Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V

Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.

Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning

3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduct
ion:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Integer linear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariableoptimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane methodand Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random,Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution ofunconstrained problem from arithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

Design and Simulation - Lab I

L T P
0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

HEAT & MASS TRANSFER – LAB

L T P
0 0 2

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment

Heat exchanger - Counter flow experiment

MANUFACTURING TECHNOLOGY-II – LAB

L T P
0 0 2

Mini

mum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

SEMESTER - VI

FLUID MACHINERY **L T P**
3 0 0

UNIT-I
Introduction: Impulse of Jet and Impulse Turbines:
Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat &curve), Classification of turbines, Impulse turbines, Constructional details, Velocitytriangles, Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II
Reaction Turbines:
Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

8

UNIT-III
Centrifugal
Pumps:
Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV
Positive Displacement and other Pumps:
Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

UNIT-V

8

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram,hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, 'Course on OpenFOAM', IIT Bombay(http://spoken-tutorial.org/)

BOOKS:

1. Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

THEORY OF MACHINES **L:T:P**
3: 1: 0

Unit I **8**

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center .

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism,.

Unit II **8**

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration,

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

Unit III **8**

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

Unit IV **8**

Balancing
:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia

governors. Effort and Power of governor

Unit V

8

Brakes and dynamometers:
Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

MACHINE DESIGN-II

L:T:P
3: 0: 0

UNIT I
Principle of transmission and conjugate action
Spur Gears
Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears
Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

UNIT II Bevel gears
Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears
Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III
Sliding Contact Bearing
Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

DepartmentalElective Course-II

REFRIGERATION & AIR CONDITIONING **L T P**

3 1 0

Unit-1

Refrigerat

ion:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:
Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4
Air Conditioning:
Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5
Refrigeration Equipment & Application:
Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production
Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.

7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I
Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II
Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III
Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

RELIABILITY ENGINEERING **L T P**
3 1 0

UNIT-I

8

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

UNIT-II

8

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

UNIT-III

8

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

UNIT-IV

8

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

UNIT-IV **8**

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

FLUID MACHINERY Lab **L T P**
0 0 2

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms

2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

Design And Simulation - Lab II **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as Cand C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computerprogram and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of asubsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.

11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

L	T	P
3	1	0

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20016-17]

YEAR IV, SEMESTER-VII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-071 to 074	Open Elective -I	3	1	0	30	20	50	100	150	4
2	NME-701	CAD	3	1	0	30	20	50	100	150	4
3	NME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
4	NME-031 to NME-034	Departmental Elective – III	3	1	0	30	20	50	100	150	4
5	NME-041 to NME-044	Departmental Elective – IV	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-751	CAD/CAM Lab	0	0	2	10	10	20	30	50	1
6	NME-752	I. C. Engine and Automobile Lab.	0	0	2	10	10	20	30	50	1
7	NME-753	INDUSTRIAL TRG.	0	0	2	-	50	50	-	50	1
8	NME-754	PROJECT	0	0	3	-	50	50	-	50	2
	GP-701	GP	-	-	-	-	-	50	-	50	-
		TOTAL	15	5	9					1000	25

Note- Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through report and viva voce etc.
Project should be initiated in 7th semester beginning **(End Semester Examination to be conducted for evaluation for 7th sem),** and should be complete by the end of 8th semester with good Report and power-point Presentation etc.

Open Electives – I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Biotechnology

Departmental Elective III

NME-031 Computer Aided Manufacturing
NME-032 Project Management
NME-033 Computational Fluid Dynamics
NME-034 Composite materials

Departmental Elective IV

NME-041 Total Quality Management
NME-042 Thermal Turbo Machines
NME-043 Mechanical System Design
NME-044 Automation and Robotics

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NPI-801	Quality Control	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective –V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective -V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing.

NME-701: COMPUTER AIDED DESIGN (CAD) **L T P**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

8

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation .

8

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

8

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/Draftsight (any one)&3d solid modeling software Solidworks/Autodesk Inventor/PTC Creo /Catia (Any one)etc.

8

UNIT-V

Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

8

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India

2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill
4. CAD/CAM: Computer Aided Design and Manufacturing, by Groover, Pearson India
5. Mathematical Elements for Computer Graphics, buy Rogers and Adams, McGraw Hill
6. Finite Element Method By S S Rao
7. FE Analysis Theory and Programming, by Krishnamoorthy, Tata McGraw Hill

NME-702: AUTOMOBILE ENGINEERING **L T P**
3 1 0

UNIT-I

Introduction:

Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

6

UNIT-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

8

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

5

Chasis and Suspension System:

Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system,Air suspension & shock absorbers.

5

UNIT-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

4

UNIT-V

Emission standards and pollution control :

Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives and modern trends in automotive engine efficiency and emission control.

5

Maintenance system:

Preventive maintenance, break down maintenance and over hauling.

2

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automobile Engineering –TTTI, Pearson India
5. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.
7. Automobile Engineering –Ramakrishna, PHI, India

NME:801 POWER PLANT ENGINEERING **L T P**

3 1 0

UNIT-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations.

3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor.s profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

3

UNIT-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

8

UNIT-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, ubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

6

UNIT-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.

3

Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.

4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

2

UNIT-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc.

2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms.

3

Pollution

Pollution due to power generation

2

Books and References:

1. Power Plant Engineering, by F.T. Morse, Affiliated East-West Press Pvt. Ltd
2. Power Plant Engineering by Hedge, Pearson India
3. Power Plant Technology, by Wakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
6. Power Plant Engineering by Gupta, PHI India
7. Power Plant Engineering. Mahesh Verma, Metropolitan Book Company Pvt. Ltd.

NPI- 801 : **QUALITY CONTROL** **L T P**
3 1 0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability.

3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation.

5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

8

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.

3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.
MTBF. Maintainability, Condition monitoring and dignostic techniques.

4

Value Engineering : Elements of value analysis, Techniques.

2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts.

6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

2

Books and Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

NME-751:CAD/CAM LAB

L	T	P
0	1	2

Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.

3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

NME-752: I.C. ENGINES AND AUTOMOBILE LAB

L	T	P
0	0	2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.

8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

DEPARTMENT ELECTIVE-III

NME-031: COMPUTER AIDED MANUFACTURING (CAM) **L T P**
3 1 0

UNIT-I

Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

8

UNIT-II

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system.
Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

8

UNIT -III

Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.
System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

8

UNIT -IV

NC Part Programming- (a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.
(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

8

UNIT-V

Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

8

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.
6. CAD/CAM: Concepts and Applications by Alavala, PHI India
7. Computer Aided Manufacturing, by Srinivas, Oxford University Press.

NME-032: PROJECT MANAGEMENT **L T P**
3 1 0

UNIT-I
Project Management Concepts
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

8

UNIT-II
Project Organization & Project Contracts
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

8

UNIT-III
Project Appraisal & Cost Estimation
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

8

UNIT-IV
Project Planning & Scheduling
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

8

UNIT-V
Modification & Extensions of Network Models
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-

essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

8

Books and References :

1. Project Management by Harvey Maylor, Pearson India
2. Project Management by Choudhury, McGraw Hill
3. Project Management by K. Nagarajan
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
5. Project Management: A Life Cycle Approach by Kanda, PHI, India
6. Project Management and Appraisal, byKhatua, Oxford University Press.

NME-033: COMPUTATIONAL FLUID DYNAMICS **L T P**
3 1 0

UNIT- I
GOVERNING EQUATIONS AND BOUNDARY CONDITIONS:
Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averagedequations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behavior of PDEs onCFD. Elliptic, Parabolic and Hyperbolic equations.

8

UNIT -II
FINITE DIFFERENCE METHOD:
Derivation of finite difference equations. Simple Methods. General Methods for first and second orderaccuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations . Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

9

UNIT- III
FINITE VOLUME METHOD (FVM) FOR DIFFUSION:
Finite volume formulation for steady state One, Two and Three dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

9

UNIT -IV
FINITE VOLUME METHOD FOR CONVECTION DIFFUSION:
Steady one-dimensional convection and diffusion. Central, upwind differencing schemes-properties ofdiscretization schemes. Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICKSchemes.

10

UNIT- V
CALCULATION FLOW FIELD BY FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and itsvariants. Turbulence models, mixing length model, Two equation (k-Є) models. High and low Reynoldsnumber models

9

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis .
3. Computational Heat Transfer, by Jaluria ans Torrance, CRC Press
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.
9. Computational Fluid Dynamics: Principles and Applications, by Blazek, Elsevier Science & Technology.

NME-034: COMPOSITE MATERIALS **L T P**
3 1 0

UNIT-1

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

7

UNIT-II

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential.

7

UNIT-III

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.

10

UNIT-IV

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix

performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

10

UNIT-V

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

6

Books and References :

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy, by G. Dieter, McGraw Hill
3. Analysis and Performance of Fiber Composites, by Agarwal, McGraw Hill
4. Thermal Analysis of Materials, by R.F. Speyer, Marcel Decker
5. Engineering Mechanics and Composite Materials , by Daniels, Oxford University Press.
6. Engineering Materials: Polymers, Ceramics and Composites, by A.K Bhargava Prentice Hall India
7. Material Science and Engineering (SIE) with CD, by Smith, McGraw Hill

DEPARTMENT ELECTIVE-IV

NME-041: TOTAL QUALITY MANAGEMENT (TQM) **L T P**
3 1 0

UNIT -I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

4

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

4

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

3

UNIT -II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

5

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

3

UNIT -III

Tools and Techniques

Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart).

3

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

3

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

3

UNIT -IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

6

UNIT -V

IS0-9000 and its concept of Quality Management

ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT in some details.

6

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.
3. TQM in New Product manufacturing, H. G. Menon, McGraw Hill.
4. Total Quality Management, by Suri, Wiley.
5. Total Quality Management, by Subburaj, McGraw Hill.
6. Total Quality Management, by Poornima Chantimath, Pearson India
7. Quality Management by Bedi, Oxford University Press.
8. Total Quality Management-Text and Cases, by Janakiraman & Gopal, PHI, India.
9. Total Quality Management, H. Lal, Eastern Limited.
10. Total Quality Management, A. Arivalagar , R. S. Naagarazan, New Age International.

NME-042: THERMAL TURBOMACHINES **L T P**
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbomachinery, Energy transfer in turbo machines, Euler's equation, Definition of variousefficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology,Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps.

8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoitydiagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient,Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guidevanes, Centrifugal Compressor characteristic curves.

4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocitydiagram for axial compressor, Factors affecting stage pressure ratio, Blockage incompressor annulus, Degree of reaction, 3-D flow, Design process, blade design,calculation of stage performance, Axial compressor performance characteristic curves.

4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocitydiagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord,Estimation of stage performance, Characteristic curves.

4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

4

Pumps : Classification of Pumps, Main components, indicator diagram and modificationdue to piston acceleration, Performance characteristics, Cavitation and its control,Miscellaneous types of pumps.

4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropydiagram, State losses, Estimation of stage performance, Performance characteristics.

4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustionsystem types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparativeevaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Designwith traditional materials.

8

Books and References:

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Fundamentals of Turbomachinery by Venkanna, PHI, India
3. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.

4. Gas Turbine- Ganeshan, Tata Mc Graw Hill.
5. Thermal Turbomachines, by Singh, Wiley
6. Fundamentals of Turbomachinery, by Venkanna, PHI, India.

NME – 043: MECHANICAL SYSTEM DESIGN **L T P**
3 1 0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, types of system, Application of system concepts, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

4

Problem Formulation : Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

4

UNIT-II

System Theories: Introduction, System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

4

System modeling

Introduction, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

4

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.

4

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

4

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.

4

Calculus Method for Optimization

Model with single decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

4

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

5

Books and References:

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Engineering Design, by Dieter, McGraw Hill
3. Design Engineering-JR Dixon, TMH, New Delhi
4. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
5. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
6. Optimization Techniques-SS Rao
7. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

NME-044: AUTOMATION AND ROBOTICS **L T P**
3 1 0

UNIT- I

AUTOMATION:

Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation.

Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

7

UNIT- II

Manufacturing Automation:

Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

7

UNIT- III

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source.

Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous

transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

9

UNIT -IV

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

9

UNIT- V

ROBOT SIMULATION

Methods of robot programming, Simulation concept, Off-line programming, advantages of off-line programming.

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

8

Books and Reference :

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India
5. Robotics , by J.J. Craig, Addison-Wesley.
6. Industrial Robots , by Groover, McGraw Hill.
7. Robots & Manufacturing Automation, by Asfahl, Wiley
8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India
9. Automation & Robotics, byGhoshal, Oxford University Press.
10. Introduction to AI Robotics, by Murphy, PHI, India.

DEPARTMENT ELECTIVE-V

NME-051: OPERATIONS RESEARCH **L T P**

3 1 0

UNIT-I

Introduction: Basic of Operation Research, Origin & development of Operation Research,Applications.

2

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

7

UNIT-II

Transportation Problem: Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced Transportation Problem.

4

Assignment Problem: Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

3

UNIT-III

Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming.

4

Sequencing: Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

3

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

4

Simulation: Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

4

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

3

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

6

Books and References:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley & Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand.
7. Operation Research Application and Algorithms, by- Wayne L Winston, Duxbury Press.
8. Operations Research, by Jha, McGraw Hill.
9. Operation Research, by Yadav & Malik Oxford University Press
10. Operations Research, by Panneerselvam, PHI, India

NME-052 : DESIGN OF THERMAL SYSTEMS **L:T:P**
3:1: 0

Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

5

Design & Selection of Air conditioning Apparatus **:**Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

3

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation. Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

8

Unit-III

Turbomachines:Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

8

Unit-IV

Design of Heat Exchanger :Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

8

Books and References:

1. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.
2. Refrigeration & Air Conditioning - By C.P. Arora, McGraw Hill
3. Refrigeration & Air Conditioning - By Manohar Prasad, New Age
4. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
5. Refrigeration & Air Conditioning Data Book – Manohar Prasad, New Age
6. ASHRAE Hand Book of Fundamentals-ASHRAE
7. Refrigeration & Air Conditioning-Stoecker & Jones, Mc Graw Hill
8. Design of High Efficiency Turbomachinery and Gas Turbine by Wilsonm and Korakianitis, PHI, India
9. Turbines compressors and Fans by Yahaya, Mc Graw Hill
10. Heat Transfer Equipment Design by Shah, CRC Press
11. Thermal System Design and Optimization by Balaji, Ane Books Pvt Ltd

NME-053: ADVANCE SYNTHESIS OF MECHANISMS

L T P
3 1 0

UNIT-I

Introduction:

Mechanisms: Classifications, Relative and absolute motion, degree of freedom, 4-barMechanisms, planar and spatial mechanisms, Inversion and equivalent linkage,Transmission angle.

4

Kinematic analysis of Planer motion: Relative velocity, Instantaneous centre, Poles and centrodes, Relative acceleration.

4

UNIT-II

Kinematic Synthesis: Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials.

4

Four bar linkage, Equation of coupler curves, Double points and symmetry, RobertChebyshev theorem, Approximate and exact straight line mechanisms .

4

UNIT-III

Graphical Synthesis of Mechanisms:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crankMechanism. Synthesis of four bar mechanisms.

8

UNIT IV

Analytical Synthesis:

Displacement equation of four bar linkage, Crank and follower synthesis with threeaccuracy points, Four bar function generator with three accuracy points, Crank andfollower synthesis, angular velocities and accelerations

8

UNIT-V

Analytical Synthesis:
Synthesis of slider crank mechanism with three accuracy points, Synthesis of slidercrank mechanism with four accuracy points, cam and follower mechanism, Analysis of mechanical errors in linkage.

8

Books and References:

1. Kinematic Synthesis of Linkages RS Hartenberg and J Denavit McGraw Hill, New York
2. Kinematic and Linkage Design AS Hall Jr Prentice Hall India Ltd.
3. Mechanism and Machine Theory Amitabh Ghosh and AK Mallick
4. Mechanism Design: Analysis &Synthesis Erdman & Sandor Prentice Hall of India
5. Kinematics and Dynamics of machinery (SIE), by Norton, McGraw Hill

NME-054: INDUSTRIAL AUTOMATION –I **L T P**
3 1 0

Unit-I:
Historical perspective of Industrial Automation
- Origin, Evolution and Need / Demand of automation in industries, Current and future Trends
- Components of Industrial Automation System and their functionalities, Layers and Types of Automation

6

Unit -II:
Automation Controllers
- Introduction of Industrial Controllers
- Programmable Logic Controller: Constructions, Types, Programming Units, Memory, I/O Modules.
- Programming methodology
- Ladder Logic programming for Industrial Applications, Timers and Counters
- Selection criteria of PLC
- Examples of PLC application

10

Unit-III:
Industrial Switching Elements
- Electronic Logic gates
- Relays, Solenoids
- Pneumatic Valves and Actuators
- Hydraulic valves and Actuators
- Interfacing: Control of Hydraulics and Pneumatics with Electric Signals
- Comparison between different switching elements

10

Unit-IV:
Visualization: Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA) Systems:

- Need for HMI
- Hardware based HMI panels
- PC based HMI Systems – SCADA
- Different Functionalities
- Benefits of implementing SCADA systems
- Case Studies of SCADA implementation.

10

Unit V:

Case Study

- Hydraulic / Pneumatic Press
- Material handling System
- Machine Tool: NC/CNC Machine

4

Books and References :

1. Programmable Logic Controllers with Control Logix, by Jon Stenerson, Delmar Publishers, 2009.
2. Hand book of industrial Automation, by Richard L Shell and Ernest L Hall, Marcel Dekker Inc., 2000.
3. Practical SCADA for Industry, by David Bailey and Edwin Wright, Newness Publishers, 2003.
4. Automation network Selection, by Dick Caro, ISA – The Instrumentation Systems and Automation Society, 2004.
5. Getting Factory Automation Right (the first time), by Edwin H Zimmerman, Manufacturing Engineers, 2001.
6. Automation, Production Systems and Computer Integrated Manufacturing, by Groover, Pearson India.
7. Industrial Instrumentation and Control, by Singh, McGraw Hill.

NME-055: ADVANCED WELDING TECHNOLOGY **L T P**
3 1 0

UNIT-I

Introduction: Welding as compared with other fabrication processes,Importance and application of welding, classification of welding processes, Health & safety measures in welding.

3

Welding Power Sources: Physics of welding Arc**,** Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

3

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

4

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

3

UNIT-II

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrogas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

11

UNIT-III

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

5

UNIT-IV

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

2

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.

4

UNIT-V

Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

5

Books and References:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principals and Practices, by- Edwars R. Bohnart, McGraw Hill Education.
3. Welding Engineering and Technology, by- R. S. Parmar, Khanna Publishsers.
4. Welding Handbooks (Vol. I & II).

DEPARTMENT ELECTIVE-VI

NME- 061: EXPERIMENTAL STRESS ANALYSIS **L T P**
3 1 0

UNIT -I

Stress: Introduction, Two-Dimensional State of Stress, Equations of Equilibrium, Stress Transformation relations, principal Stresses, Special States of Stress.

4

Strain: Introduction, Displacement and Strain, Strain Transformation relations, principal strains, Stress Strain Relations, for Two-Dimensional State of Stress.

4

UNIT- II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis.

4

Brittle Coating Method: Introduction, Coating Stresses, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

4

UNIT -III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor.

4

Strain Gage Circuit: Potentiometer, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.Three Element Rectangular Rosette

4

UNIT- IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Stressed Model in Circular Polariscope.

8

UNIT -V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method.

8

Books and References :

1. Experimental Stress Analysis, by U C Jindal, Pearson India
2. Experiment Stress Analysis, by James W. Dally and William F. Riley, McGraw-Hill International
3. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.
4. Advance Strength and Applied Stress Analysis, by Budynas, McGraw-Hill

NME- 062: PLANT LAYOUT AND MATERIAL HANDELING **L T P**
310

UNIT -I

Introduction

Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

8

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design

Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

8

UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic.

Material Handling: Material handling principles; material handling equipment and material handling systems.

8

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. **Warehouse operations**: function, storage operations.

Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems,

Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.

8

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

8

Books and References:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6. Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons.
7. Plant Design and Economics, by- Peters, McGraw Hill Education.
8. Purchasing and Material Management, by- Gopalakrishnan, McGraw Hill Education.

NME-063: ADDITIVE MANUFACTURING

L	T	P
3	1	0

UNIT-I

Introduction

History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, **Direct and Indirect Processes;** Prototyping, Manufacturing and Tooling.

4

Layer Manufacturing Processes; Polymerization, Sintering and Melting, Extrusion, Powder-Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosolprinting and Bioplotter.

4

UNIT-II

Development of Additive Manufacturing Technology

Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems.

3

Generalized Additive Manufacturing Process Chain; The Eight Steps in Additive Manufacturing, Variation from one AM Machine to Another, Metal System, Maintenance of Equipment, Material Handling Issue, Design of AM.

5

UNIT-III

Additive Manufacturing Processes

Vat Photopolymerization; Materials, Reaction Rates, Photopolymerization Process Modeling, Scan Patterns, **Powder Bed Fusion Processes;** Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling, **Extrusion Based System;** Basic principles, plotting and Path Control, Bioextrusion, Other Systems, **Material Jetting;** Materials, Material Processing Fundamentals, Material Jetting Machines, **Binder Jetting;** Materials, Process Variations, BJ Machines, **Sheet lamination Processes;** Materials, Ultrosonic Additive Manufacturing, **Directed Energy Deposition Processes;** General DED Process Description, Material Delivery, DED systems, Process Parameters, Processiong-Structure-Properties Relationships, **Direct Write Technologies;** Ink-Based DW, laser Transfer DW, Thermal Spray DW, Beam Deposition DW, Liquid Phase Direct Deposition, Hybrid Technologies.

8

UNIT-IV

Design & Software Issues

Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM.

4

Software Issue for Additive Manufacturing; Introduction, Preperation of CAD Models: The STL file, Problem with STL file, STL file Manupulation, Beyond the STL file, Additional Software to Assist AM.

4

UNIT-V

Material Design & Quality Aspects

Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Intellectual Property, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing, Business Opportunities

4

Applications

Aerospace, Automotive, Manufacturing, Architectural Engineering, Art, Jewelry, Toys, Medical, Biomedical, Dental, Bio-printing, Tissue & Organ Engineering and many others.

4

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson , DSavid W. Rosen , Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
4. Rapid Prototyping: Principles and Applications, by - Chee Kai Chua, Kah Fai Leong, Chu Sing Lim.

NME-064: COMPUTER AIDED PROCESS PLANNING **L T P**
3 1 0

UNIT-I

Introduction to CAPP: Principles, scope and information requirement for CAPP, Role of process planning, Manual and experienced based process planning, Advantages of CAPP over conventional process planning, Decision table and decision trees, process capability analysis, Tolerance analysis, Variant process planning, Generative approach, Forward and Backward planning.

8

UNIT-II

Computer Aided Process Planning: Logical design of process planning systems, Implementation considerations, Computer based process monitoring and control, Computer and process interfacing, Totally integrated process planning systems, Process planning for rotational and prismatic parts, Machining of curves and surfaces, Five axis machining, Process planning of freedom surfaces, Development of NC codes, Computer aided design of fixtures, Inspection policies and inspection planning, Expert systems and their use in developing process planning systems.

8

UNIT-III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications. Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples. Generative CAPP system: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

8

UNIT-IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes, design and manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances.

8

UNIT-V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods. Implementation techniques for CAPP: MIPLAN system, Computer programming languages tbr CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

8

Books and References:

1. Production Systems and Computer Integrated Manufacturing System, by- Mikell P Groover, Prentice Hall.
2. Computer Processing of Remotely Sensed Images: An Introduction, 3rd Edition, by- Mather Paul, Wiley.
3. Computer Aided Process Control, by- SK Singh, PHI Learning Pvt. Ltd.
4. Computer Aided Design and Manufacturing, by- M. Sarcar, K. L. Narayan, PHI Learning Pvt. Ltd.

NME-065: NON-DESTRUCTIVE TESTING **L T P**
3 1 0

Unit-I

Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

6

Unit-II

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zyglo test, Illustrative examples and interpretation of defects.

5

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Non-ferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

5

Unit-III

Radiographic methods

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ-ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

8

Unit-IV

Ultrasonic testing methods

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

8

Unit-V

Special NDT Techniques

Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

8

Books and References:

1. Non-Destructive Testing and Evaluation of Materials, by- Prasad, McGraw Hill Education.
2. Basics of Non-Destructive Testing, by Lari & Kumar, KATSON Books.
3. Practical Non-destructive Testing, by- Baldev Raj, T. Jayakumar, M. Thavasimuthu, Woodhead Publishing.
4. Non-Destructive Testing Techniques, by- Ravi Prakash, New Age International.
5. Nondestructive Testing Handbook,by Robert C. McMaster, American Society for Nondestructive.
6. Introduction to Nondestructive Testing: A Training Guide, by- Paul E. Mix, wiley.
7. Electrical and Magnetic Methods of Non-destructive Testing, by- J. Blitz, springer.

Board of Technical Education, Uttar Pradesh

STUDY & EVALUATION SCHEME

For

DIPLOMA IN PHARMACY

AT

DEPARTMENT OF PHARMACY

MEERUT INSTITUTE OF TECHNOLOGY

Approved by Pharmacy Council of India (PCI), New Delhi and All India Council for Technical Education (AICTE), New Delhi & Affiliated to Board of Technical Education, Uttar Pradesh (BTEUP), Lucknow

College Code: 1911

ORDINANCE, SCHEME & SYLLABUS FOR DIPLOMA IN PHARMACY

Course Title : Diploma in Pharmacy
Abbreviation : D. Pharm.
Type of Course : A Two years Diploma course
Pattern : Yearly
Award of the Degree : Diploma will be awarded for those passing in both the years as per rules and regulations.

O-D. Ph. 1. DURATION OF THE COURSE: The duration of the course shall be for two academic years, with each academic year spread over a period of not less than one hundred and eighty working days in addition to 500 hours practical training spread over a period of not less than 3 months.

O-D. Ph.2. ELIGIBILITY FOR ADMISSION: No. Candidate shall be admitted to Diploma in Pharmacy Pt. I unless he/she had passed any of the following examinations in all the optional subjects and compulsory subjects (Physics, Chemistry, Biology and /or Mathematics including English as one of the Compulsory subjects):

a) Intermediate examination in Science; The First Year of the three year degree course in Science; 10+2 Examination(Academic stream) in Science;
b) Pre-degree examination; any other qualification approved by the Pharmacy Council of India as equivalent to any of the above exam.

Admission of candidates to the Diploma in Pharmacy Part - I shall be made in order of merit on the basis of 'Pre-Pharmacy Test' conducted in accordance with the scheme of Examinations and syllabus laid-down by the University.

O- D. Ph.3. ELIGIBILITY FOR APPEARING IN EXAMINATION

(a) Eligibility for appearing at the Diploma in Pharmacy Part-I Examination: Only such candidates who produce-certificate from the Head of the Academic Institution in which he/she has undergone the Diploma in Pharmacy Part-I course, in proof of his/her having regularly and satisfactorily undergone the course of study by attending not less than 75% of the classes held both in theory and in practical separately in each, shall be eligible for appearing at the Diploma in Pharmacy (Part-I) examination.
(b) Eligibility for appearing at the Diploma in Pharmacy Part-II Examination: Only such candidates who produce certificate from the Head of the academic institution in which he/she has undergone the Diploma in Pharmacy Part-II course, in proof of his/her having regularly and satisfactorily attending not less than 75% of the classes held both in theory and practicals separately in each subject, shall be eligible for appearing at the Diploma in Pharmacy (Part-II) examination.
(c) A candidate can have a relaxation of 10% attendance on medical ground by producing a certificate from medical officer of government hospital and a 5% relaxation by the vice chancellor on the recommendation of Dean, faculty.

O-D. Ph. 4.GENERAL

(A) **Course of Study**: The course of study for Diploma in Pharmacy part-I and Diploma in pharmacy part- II shall include the subjects as given in the Tables I & II below. The number of hours devoted to each subject for its teaching is given against columns 2 and 3 of the Tables below.

TABLE-I Diploma in Pharmacy (Part-I)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-I	75	3	100	4
Pharmaceutical Chemistry-I	75	3	75	3
Pharmacognosy	75	3	75	3
Biochemistry & Clinical Pathology	50	2	75	3
Human Anatomy & Physiology	75	3	50	2
Health Education & community pharmacy	50	2		
	400	16	375	15

TABLE-II Diploma in Pharmacy (Part-II)

Subject	Theory		Practical	
	hours /year	Hrs. /week	hours /year	Hrs/ week
Pharmaceutics-II	75	3	100	4
Pharmaceutical Chemistry-II	100	4	75	3
Pharmacology & Toxicology	75	3	50	2
Pharmaceutical Jurisprudence	50	2	-	
Drug store and Business Management	75	3	-	
Hospital & Clinical Pharmacy	75	3	50	2
	450	18	275	11

(b) Examinations: There shall be an examination for Diploma in Pharmacy (part-I) to examine students of the first year course and an examination for Diploma in Pharmacy (part-II) to examine students of the second year course. Each examination may be held twice every year. The first examination in every year shall be the annual examination and the second examination shall be supplementary examination of the Diploma in Pharmacy (part-I) or Diploma in pharmacy (Part-II)as the case may be. The examinations shall be of written and practical (including oral) nature. Carrying maximum marks for each part of subject, as indicated in Table III and IV:R-29(A) (Plan and scheme of examination for Diploma in Pharmacy).

O-D. Ph.5. PRACTICAL TRAINING

Diploma in Pharmacy (Part-III)

(a)Period and other conditions of practical training:

After having appeared in Part-II examination of Diploma in Pharmacy conducted by Board/University or other approved examination Body or any other course accepted

as being equivalent by the Pharmacy Council of India, a candidate shall be eligible to undergo practical training in one or more of the following institutions namely:
Hospitals/Dispensaries run by Central/State Government/Municipal corporations/ central Government Health scheme and Employees state Insurance scheme. A pharmacy, chemist and Druggist licensed under the Drugs and cosmetics Rules, 1945 made under the Drugs and Cosmetics Act,1940(23 of 1940). The institutions referred in sub-regulation(1)shall be eligible to impart training subject to the condition that the number of student pharmacists that may be taken in any Hospital, pharmacy, Chemist and Druggist licensed under the Drugs and cosmetics Rules,1945 made under the Drugs and cosmetics Act,1940 shall not exceed two where there is one registered pharmacist engaged in the work in which the student pharmacist is undergoing practical training, where there is more than one registered pharmacist similarly engaged, the number shall not exceed one for each additional such registered pharmacist. Hospital and Dispensary other than those specified in sub-regulation(1)for the purpose of giving practical training shall have to be recognized by pharmacy council of India on fulfilling the conditions specified in Appendix-D to these regulations.

In the course of practical training, the trainees shall have exposure to: Working knowledge of keeping of records required by various acts concerning the profession of pharmacy and Practical experience in the manipulation of pharmaceutical apparatus in common use, the reading, translation and copying of prescription including checking of dose, the dispensing of prescriptions illustrating the commoner methods of administering medicaments; the storage of drugs and medical preparations. The practical training shall be not less than five hundred hours spread over a period of not less than three months provided that not less than two hundred and fifty hours and devoted to actual dispensing of prescriptions.

(b) **Procedure to be followed prior to commencing of the training**:

The head of the academic training institution, shall supply application in triplicate in' Practical Training Contract Form for Qualification as pharmacist' to candidate eligible to under-take the said practical training, the contract form shall be as specified in Appendix-E to these regulations.
The head of an academic training institution shall fill section I of the contract Form. The trainee shall fill section II of the said contract Form and the Head of the institution agreeing to impart the training (hereinafter referred to as the Apprentice Master) shall fill section III of the said contract Form.
It shall be the responsibility of the trainee to ensure that one copy (hereinafter referred to as the first copy of the contract Form)so filled is submitted to Head of the academic training institution and the other two copies(hereinafter referred to as the second copy and the third copy)shall be filled with Apprentice Master(if he so desires)or with the trainee pending completion of the training.

(c) **Certificate of Passing Diploma in Pharmacy(part-III)** on satisfactory completion of the apprentice period, the Apprentice Master shall fill Section IV of the second copy and third copy of contract form and cause it to be sent to the head to the academic training institution who shall suitably enter in the first copy of the

entries from the second copy and third copy and shall fill section V of the three copies of contract form and thereafter handover both the second copy and the third copy to the trainee. Thus, if completed in all respect, shall be regarded as a certificate of having successfully completed the course of Diploma in Pharmacy (part-III).

O-D. Ph.6. Working out of Result

(a) Mode of examinations:

Each theory and practical examination in the subject mentioned in Table-III and IV shall be of three hours duration. A candidate who fails in theory or practical examination shall reappear in such theory or practical paper(s) as the case may be. Practical examination shall also consist of viva voce (oral) examination.

(b) Award of sessional marks and maintenance of records:

A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Diploma in Pharmacy Part-I and Diploma in pharmacy Part-II courses, shall be maintained for each student in the institution and 20 marks for each theory and 20 marks for each practical subject shall be allotted as sessional.

There shall be at least three periodic sessional examinations during each academic year. The highest aggregate of any two performances shall form the basis of calculating sessional marks.

The sessional marks in practicals shall be allotted on the following basis:

Actual performance in the sessional examination.	10
Day to day assessment in the practical class work.	10

(c) Minimum marks for passing the examination: A student shall not be declared to have passed Diploma in Pharmacy examination unless he/she secures atleast 40% marks in each of the subject separately in theory examination, including sessional marks and atleast 40% marks in each of the practical examination including sessional marks. The candidates securing 60% marks or above in aggregate in all subjects in a single attempt at the Diploma in Pharmacy (part-I)or Diploma in Pharmacy(part- II)examinations shall be declared to have passed in first class the Diploma in Pharmacy(part-I)of Diploma in Pharmacy (part-II)examinations, as the case may be. Candidates securing 75% marks or above in any subject or subjects provided he/she passes in all the subjects in single attempt, will be given distinction in that subjects(s).

(d) Eligibility for Promotion to Diploma in Pharmacy (Pt. II): All candidates who have appeared for all the subjects and passed the Diploma in pharmacy part-I class. However failure in more than two subjects (each Theory paper or practical examination shall be considered as a subject) shall debar him/her from promotion to the Diploma in Pharmacy Part-II class. Such candidates shall be examined in the failing subjects only at subsequent. A candidate who fails to pass D Pharm Part - I exam. in four attempts shall not allowed to continue the course.

(e) Improvement of sessional marks: Candidates who wish to improve sessional marks can do so by appearing in two additional sessional examinations during the next academic year. The average score of the two examinations shall be the basis for improved sessional marks in theory. The sessional of practicals shall be improved by appearing in additional practical examinations. Marks awarded to a candidate for day to day assessment in the practical class, can not be improved unless he/she attends regular course of study again.

(f) Certificate of passing examination for Diploma in Pharmacy (part-II): Certificate of having passes the examination for the Diploma in pharmacy Part-II shall be granted by the Examining Authority to a successful student.

(g) Certificate of Diploma in Pharmacy: A certificate of Diploma in pharmacy shall be granted by the Examining Authority to successful candidate on producing certificate of having passed the Diploma in Pharmacy part-I and Part-II and satisfactory completion of practical training for Diploma in pharmacy (part-III).

(h) The chairman and at least one expert member of examining committee of the Examining Authority Concerned with appointment of examiners and conduct of pharmacy examination should be persons possessing pharmacy Qualifications.

PLAN AND SCHEME OF EXAMINATION FOR THE DIPLOMA IN PHARMACY

(Based on effective teaching for 180 working days in one academic session)

Table-III Diploma in pharmacy (part-I) Examination

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	**Sessionall**	**Total**	**Examination**	**Sessional**	**Total**
Pharmaceutics-I	80	20	100	80	20	100
Pharmaceutical Chemistry-I	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Biochem. & Clinical Pathology	80	20	100	80	20	100
Human Anatomy & Physiology	80	20	100	80	20	100
Health Education & community pharmacy	80	20	100			
			600			500

TABLE-IV Diploma in Pharmacy (Part-II)

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	**Sessional**	**Total**	**Examination**	**Sessional**	**Total**
Pharmaceutics-II	80	20	100	80	20	100
Pharmaceutical Chemistry-II	80	20	100	80	20	100
Pharmacology & Toxicology	80	20	100	80	20	100
Pharmaceutical Jurisprudence	80	20	100			
Drug store and Business Management	80	20	100			
Hospital & Clinical Pharmacy	80	20	100	80	20	100
			600			400

Note: Each paper shall consist of six questions out of which five shall be attempted. Half of the total number of papers in each year will be set and assessed by external examiners and the remaining half will be set and assessed by the internal examiners. There shall be one external and one internal examiner for each practical Examination.

SYLLABUS

DIPLOMA IN PHARMACY (PART-I)

1.1 PHARMACEUTICS I

Theory (75 Hours)

Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarization with new drug delivery systems. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

Metrology-System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products .Use of alligation method in calculations
.Isotonic solutions.

Packaging of pharmaceuticals-Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.
Size reduction, objectives, and factors affecting size reduction, methods of size reduction-study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

Size separation-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

Mixing and Homogenization-Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, planetary Mixer; Agitated powder mixer; Triple Roller Mill; Propeller Mixer, colloid Mill and Hand Homogeniser. Double cone mixer.

Clarification and Filtration-Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, sintered filters, Filter candles, Metafilter.

Extraction and Galenicals-

(a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts.
(b) Introduction to Ayurvedic dosage forms.

Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.

Distillation-Simple distillation and Fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of purified water I.P. and water for Injection I.P. construction and working of the still used for the same.

Introduction to drying process-Study of Tray Dryers; Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.

Sterilization-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process.
Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization.

Aseptic techniques-Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

Processing of Tablets-Definition; different type of compressed tables and their properties. Processes involved in the production of tablets; Tablets excipients ; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be de.. in an elementary manner).

Processing of Capsules-Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.

Study of immunological products like sera, vaccines, toxoids & their preparations.

PRACTICAL (100 hours)

Preparation (minimum number stated against each of the
following categories illustrating different techniques involved.
1. Aromatic waters3
2. Solutions 4
3. Spirits2
4. Tinctures4
5. Extracts2
6. Creams2
7. Cosmetic preparations3
8. Capsules2
9. Tables2
10. Preparations involving2
11. Opthalmic preparations2
12. Preparations involving aseptic techniques2

Books recommended:(Latest editions)
1.) Remington's Pharmaceutical Sciences.
2.) The Extra Pharmacopoeia-Martindale.

1.2 PHARMACEUTICAL CHEMISTRY-I

THEORY (75 Hours)

General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

Acids, bases and buffers-Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

Gastrointestinal agents-
Acidifying agents- Dilute Hydrochloric acid.
Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.
Protective and Adsorbents- Bismuth sub carbonate and Kaolin.
Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

Topical Agents-
Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.
Antimicrobials and Astringents- Hydrogen peroxide*, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone-iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury yellow, Mercuric oxide, Ammoniated mercury.
Sulphur and its compounds- Sublimed sulphur, Percipitated sulphur, Selenium sulphide. Astringents- Alum and Zinc Sulphate.

Dental Products- Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Di- calcium phosphate ,Strontium chloride, Zinc chloride.
Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

Respiratory stimulants- Ammonium carbonate.

Expectorants and Emetics-Ammonium chloride*, Potassium iodide, Antimony potassium tartrate.

Antidotes- Sodium nitrite.

Major Intra and Extra cellular electrolytes-
Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations.
Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection.

Combination of oral electrolyte powders and solutions.

Inorganic official compounds of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.

Radio pharmaceuticals and contrast media- Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media- Barium sulfate.

Quality control of Drugs and pharmaceuticals-Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.

Identification tests for cations and anions as per Indian Pharmacopoeia.

PRACTICAL (75 hours)

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.
2. Limit test for chloride, Sulfate, Arsenic, Iron and Heavy metals.
3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds marked with (*) under theory.
    i. Acid-Base titrations(at least 3)
    ii. Redox titrations (one each of permanganometry and iodimetry).
    iii. Precipitation titrations (at least 2)
    iv. Complexometric titration (Calcium and Magnesium).

Books recommended (Latest editions)

1. Indian pharmacopoeia.

1.3 PHARMACOGNOSY

THEORY (75 Hours)

1. Definition, history and scope of Pharmacogonosy including indigenous system of medicine.
2. Various systems of classification of drugs and natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.
4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

(a) **Laxatives**- Aloes, Rhubarb, Castor oil, Ispaghula, Senna.

(b) **Cardiotonics**- Digitalis, Arjuna.

(c) **Carminatives & G.I. regulators**- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper , Asafoetida, Nutmeg, Cinnamon, Clove.

(d) **Astringents**- Catecheu.

(e) **Drugs acting on nervous system**- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux -vominca.

(f) **Antihypertensive**- Rauwolfia.

(g) **Antitussives**- Vasaka, Tolu balsam, Tulsi.

(h) **Antirheumatics**- Guggal, Colchicum.

(i) **Antitumour**- Vinca.

(j) **Antileprotics**- Chaulmoogra oil.

(k) **Antidiabetics**- Pterocarpus, Gymnema sylvestro.

(l) **Diuretics**- Gokhru, Punarnava.

(m) **Antidysenterics**- Ipecacuanha.

(n) **Antiseptics and disinfectants**- Benzoin, Myrrh, Neem, Curcuma.

(o) **Antimalarials**- Cinchona.

(p) **Oxytocics**- Ergot.

(q) **Vitamins**- Shark liver oil and Amla.

(r) **Enzymes**- Papaya, Diastase, Yeast.

(s) **Perfumes and flavoring agents**- peppermint oil, Lemon oil, Orange oil, lemon grass oil, sandal wood.

Pharmaceutical aids-Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia,
Tragacanth, sodium Alginate, Agar,
Guar gum, Gelatin.
Miscellaneous- Liquorice, Garlic, picrorhiza, Dirscorea, Linseed, shatavari, shankhpushpi, pyrethrum, Tobacco.
Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwalfia, Digitalis, senna.
Study of source, preparation and identification of fibers used in sutures and surgical dressings-cotton ,silk, wool and regenerated fibers.
Gross anatomical studies of-senna , Datura, cinnamon, cinchona, fennal, clove, Ginger, Nuxvomica & ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drugs by morphological characters. Physical and chemical tests for evaluation of drugs wherever applicable.
2. Gross anatomical studies(t.s.)of the following drugs :Senna, Datura, cinnamon, cinchona, coriander, fennel , clove, Ginger, Nux-vomica, Ipecacuanha.
3. Identification of fibers and surgical dressing.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

THEORY (50 Hours)

Introduction to biochemistry. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.

Carbohydrates: Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.

Lipids: Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.

Vitamins: Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes.

Enzymes: Brief concept of enzymatic action. factors affecting it.

Therapeutics: Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

PRACTICAL (75 Hours)

1. Detection and identification of proteins. Amino acids, carbohydrates and lipids.
2. Analysis of normal and abnormal constituents of Blood and Urine (Glucose, urea, creatine, cretinine, cholesterol, alkaline phosphatatase acid phosphatase, Bilirubin, SGPT, SGOT, calcium, Diastase, Lipase).
3. Examination of sputum and faeces (microscopic & staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes, withdrawal of blood samples.

1.5 HUMAN ANATOMY AND PHYSIOLOGY

THEORY(75 Hours)

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeltal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas

Reproductive system: Physiology and Anatomy of Reproductive system.

PRACTICALS (50 hours)

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:

Digestive system	Respiratory system	Ear
Cardiovascular system	Urinary system	
Reproductive system	Eye	

3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

1.6 HEALTH EDUCATION AND COMMUNITY PHARMACY

THEORY (50 hours)

Concept of health: Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.
Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.

First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.

Environment and health: Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases.

Fundamental principles of microbiology: Classification of microbes, isolation, staining techniques of organisms of common diseases.

Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections- chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.

Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.

Arthropod borne infections-plague, Malaria, filariases.

Surface infection-Rabies, Tranchoma, Tetanus, Leprosy. **Sexually transmitted diseases**-Syphilis, Gonorrhoea, AIDS.

Non-communicable diseases: causative agents, prevention, care and control.

Epidemiology: Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments.

2.1 PHARMACEUTICS II
(Dispensing Pharmacy)

THEORY (75 Hours)

Prescriptions-Reading and understanding of prescriptions; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
Incompatibilities in prescriptions- study of various types of incompatibilities-physical, chemical and therapeutic.
Posology- Dose and dosage of drugs, factors influencing dose, calculations of doses on the basis of age, sex, surface area and veterinary doses.
Dispensed Medications: (Note: A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures. special labeling requirements and storage conditions should be high-lighted).
Powders-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates. preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.

Liquid oral Dosage forms:
Monophasic-Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colorants and flavors, with examples.
Review of the following monophasic liquids with details of formulation and practical methods. Liquids for internal administration Liquids for external administration or used on mucous membranes
Mixtures and concentrates, Gargles

Syrups Mouth washes	Throat-paints	Elixirs
Douches	Ear Drops	Nasal drops
Sprays	Liniments	Lotions.

Biphasic Liquid Dosage Forms:
Suspensions (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant used like thickening agents, wetting agents, their necessity and quantity to be incorporated ,suspensions of precipitate forming liquids like tinctures, their preparations and stability. suspensions produced by chemical reaction. An introduction to flocculated /non-flocculated suspension system.
Emulsions-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.

Semi-Solid Dosage Forms:

Ointments: Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes:

Trituration fusion
chemical reaction Emulsification.

Pastes: Differences between ointments and pastes, Bases of pastes. preparation of pastes and their preservation .

Jellies: An introduction to the different types of jellies and their preparation. An elementary study of poultice.

Suppositories and peassaries-Their relative merits and demerits, types of suppositories, suppository bases , classification, properties. preparation and packing of suppositories. Use of suppositories of drug absorption.

Dental and cosmetic preparations: Introduction to Dentifrices, facial cosmetics, Deodorants. Anti- perspirants, shampoo, Hair dressings and Hair removers.

Sterile Dosage forms:

Parenteral dosage forms-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and personnel, Facilities and quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids.

Sterility testing: particulate matter monitoring- Faculty seal packaging.

Ophthalmic products: study of essential characteristics of different ophthalmic preparations. Formulation: additives, special precautions in handling and storage of ophthalmic products.

PRACTICAL (100 hours)

Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsion, solutions, liniments, E.N.T. preparations. Ointments, suppositories, powders, incompatible prescriptions etc.

Books recommended: (Latest editions)

1. Indian Pharmacopoeia.
2. British pharmacopoeia.
3. National formularies(N.F.I.,B.N.P)
4. Remington's pharmaceutical sciences.
5. Martindale's Extra pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTRY II

THEORY (100 hours)

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic system containing up to 3 rings.
2. The chemistry of following pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties(chemical structure of only those compounds marked with asterisk (*). The stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants-Proflavine*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlophene, Nitrofurantoin.

Sulphonamides- Sulphadiazine, Sulphaguanidine, Phthalylsulphathaizole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxypyridazine, Co-trimoxazole, sulfacetamide*

Antileprotic Drugs- Clofazimine , Thiambutosine, Dapsone*, solapsone,

Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide*.

Antimoebic and Anthelmintic Drugs- Emetine, Metronidazole, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin , Piperazine*, Mebendazole ,D.E.C.*

Antibiotics- Benzyl penicillin*, Phenoxy methyl penicillin*, Benzathine penicillin, Ampicillin*, Cloxacillin, Carbencicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

Antifungal agents- Udecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.

Antimalarial Drugs-Chloroquine*,Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.

Tranquilizers-Chlorpromazine*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperiodol*, Triperiodol, Oxypertine, Chlordizepoxide, Diazepam*, Lorazepam, Meprobamate.

Hypnotics- Phenobarbitone*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide*, Methyprylon, Paraldehyde, Triclofosodium.

General Anaesthetics-Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopecal sodium, Trichloroethylene .

Antidepressant Drugs- Amitriptyline, Nortryptyline, Imperamine*, Phepelzine, Tranylcypromine.

Analeptics- Theophylline, Caffeine*, Coramine*, Dextro-amphetamine.

Adrenergic drugs- Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrne*, Pseudoephedrine.

Adrenergic antagonist- Tolazoline, Propranolol*, Practolol.

Cholinergic Drugs- Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*. **Cholinergic Antagonists**- Atropine*, Hyoscine, Homatropine,

Propantheline*, Benztropine, Tropicamide, Biperiden*.

Diuretic Drugs- Furosemide*, Chlorothiazide, Hydrochlorothiazidc*, Benzthiazide, Urea*, Mannitol*, Ethacrynic Acid.

Cardiovascular Drugs- Ethylnitrite*, Glyceryl trinitrate, Alpha methyldopa, Guanethidine, Clofibrate, Quinidine.

Hypoglycemie Agents- Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin. **Coagulants and Anti coagulants**- Heparin, Thrombin, Menadione*, Bisphydroxy-coumarin, Warfarin sodium.

Local Anaesthetics- Lignocaine*, Procaine*, Benzocaine,

Histamine and anti Histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine*, Pheniramine, Chlorpheniramine*,

Analgesics and Anti-pyretics-Morphine, Pethidine, Codeine, Mathadone, Aspirin*, Paracetamol, Analgin, Dextropropoxphene, Pentazocine.

Non-steriodal anti-inflammatoryagents- Indomethacin*, Phenylbutazone*, Oxyphenbutazone, Ibuprofen.

Thyroxine and Antithyroids- Thyroxine*, Methimazole, Methyl thiouracil, Propylthiouracil.

Diagnostic Agents- Lopanoic Acid, Propyliodone, Sulfobromopthalein-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium.

Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins.

Steroidal Drugs- Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

Anti-Neoplastic Drugs- Actinomycin, Azathioprie, Busulphan, Chloramubucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochoride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended: (Latest editions)

1. Pharmacopoeia of India.
2. British Pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

PRACTICAL (75 hours)

1. Systematic qualitative testing of organic drugs involving solubility determination, melting point and/or boiling point, detection of elements and functional groups (10 compounds).
2. Official identification tests for certain groups of drugs included in the I.P. like barbiturates, sulfonamides, Phenothiazines, Antibiotics etc.(8 compounds).
3. Preparation of three simple organic preparations.

2.3 PHARMACOLOGY & TOXICOLOGY

THEORY (75 hours)

Introduction to pharmacology, scope of pharmacology.

Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

General mechanism of drugs action and their factors which modify drugs action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspects:

Drugs acting on the central Nervous system:

General anaesthetics- adjunction to anaesthesia, intravenous anaesthetics. Analgesic antipyretics and non-steroidal
Anti-inflammatory drugs- Narcotic analgesics.
Antirheumatic and anti-gout remedies.
Sedatives and Hypnotics, psychopharmacological agents, anticonvulsants, analeptics. Centrally acting muscle relaxants and anti parkinsonism agents.
Local anesthetics.
Drugs acting on autonomic nervous system.
Cholinergic drugs, Anticholinergic drugs, anticholinesterase drugs. Adrenergic drugs and adrenergic receptor blockers.
Neurone blockers and ganglion blockers. Neuromuscular blockers, used in myasthenia gravis.
Drugs acting on eye: Mydriatics, drugs used in glaucoma.

Drugs acting on respiratory system
Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

Autocoids: physiological role of histamine and serotonin, Histamine and Antihistamines, prostaglandins.

Cardio vascular drugs
Cardiotonics, Antiarrhythmic agents, Anti-anginal agents, Antihypertensive agents, peripheral Vasodilators and drugs used in atherosclerosis.
Drugs acting on the blood and blood forming organs. Haematinics, coagulants and anticoagulants, Haemostatic , Blood substitutes and plasma expanders.

Drugs affecting renal function- Diuretics and anti-diuretics.

Hormones and hormone antagonists- Hypoglycemic agents, Anti--thyroid drugs, sex hormones and oral contraceptives , corticosteroids.

Drugs acting on digestive system-carminatives, digest ants, Bitters, Antacids and drugs used in peptic ulcer, purgatives ,and laxatives, Antidiarrohoeals, Emetics, Anti-emetics,

Antispasmodics.

Chemotherapy of microbial diseases:
Urinary antiseptics, sulphonamides, penicillin, streptomycin, Tetracyclines and other antibiotics. Anti- tubercular agents, Antifungal agents, antiviral drugs, anti-leprotic drugs. Chemotherapy of protozoal diseases, Anthelmintic
drugs. Chemotherapy of cancer.

Disinfectants and antiseptics.

PRACTICAL (50 hours)

1. The first six of the following experiments will be done by the students while
2. the remaining will be demonstrated by the teacher.
3. Effect of potassium and calcium ions, acetylcholine and adrenaline on frog's heart.
4. Effect of acetyl choline on rectus abdomens muscle of frog and guinea pig ileum.
5. Effect of spasmogens and relaxants on rabbits intestine.
6. Effect of local anaesthetics on rabbit cornea.
7. Effect of mydriatics and miotics on rabbit's eye.
8. To study the action of strychnine on frog.
9. Effect of digitalis on frog's heart.
10. Effect of hypnotics in mice.
11. Effect of convulsants and anticonvulsant in mice or rats.
12. Test for pyrogens.
13. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
14. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

2.4 PHARMACEUTICAL JURISPRUDENCE

THEORY (50 hours)

Origin and nature of pharmaceutical legislation in India, its scope and objectives. Evolution of the "Concept of pharmacy" as an integral part of the Health care system.

Principles and significance of professional Ethics. Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India.

Pharmacy Act,1948-The General study of the pharmacy Act with special reference to Education Regulations ,Working of state and central councils, constitution of these councils and functions, Registration procedures under the Act.

The Drugs and Cosmetics Act,1940-General study of the Drugs and cosmetics Act and the Rules there under. Definitions and salient features related to retail and whole sale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954-General study of the Act, objectives , special reference to be laid on Advertisements, magic remedies and objections1 and permitted advertisements -diseases which cannot be claimed to be cured.

Narcotic Drugs and psychotropic substances Act,1985-A brief study of the act with special reference to its objectives, offences and punishment.

Brief introduction to the study of the following acts:

Latest Drugs (price control) order in force. Poisons Act 1919(as amended to date)

Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date**).**

Medical Termination of Pregnancy Act, 1971(as amended to date).

Books recommended:(Latest editions)
Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

THEORY (75 hours)

Part I Commerce (50 hours)

Introduction-Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution.

Drug House Management-selection of site, space Lay-out and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto.Codification, handling of drug stores and other hospital supplies. Inventory Control-objects and importance, modern techniques like ABC,VED analysis, the lead time, inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal.

Sales promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

Recruitment, training, evaluation and compensation of the pharmacist.

Banking and Finance-Service and functions of bank, Finance planning and sources of finance.

Part II Accountancy (25 hours)

Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet.
Simple techniques of analyzing financial statements. Introduction to Budgeting.

Books Recommended: (Latest editions)

2.6 HOSPITAL AND CLINICAL PHARMACY

THEORY (75 hours)

Part-I: Hospital Pharmacy:

Hospital-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India.

Hospital Pharmacy: Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men.
Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists.
Drug Distribution system in Hospitals. Out-patient service,
In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.

Manufacturing: Economical considerations, estimation of demand.

Sterile manufacture-Large and small volume parenterals, facilities, requirements, layout production planning , man-power requirements.

Non-sterile manufacture-Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials.

Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories.
P.T.C.(pharmacy Therapeutic Committee)

Hospital Formulary system and their organization, functioning, composition.

Drug Information service and Drug Information Bulletin.

Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply eg. I.V.sets, B.G. sets, Ryals tubes, Catheters, Syringes etc
.
Application of computers in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital retail pharmacy establishment.

Part II: Clinical Pharmacy:

Introduction to Clinical pharmacy practice- Definition, scope.

Modern dispensing aspects- Pharmacists and patient counseling and advice for the use of common drugs, medication history.

Common daily terminology used in the practice of Medicine.

Disease, manifestation and patho-physiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

Physiological parameters with their significance.

Drug Interactions: Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction.
Adverse Drug Reaction: Definition and significance. Drug-Induced diseases and Teratogenicity.

Drugs in Clinical Toxicity- Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons.

Drug dependences, drug abuse, addictive drugs and their treatment, complications.

Bio-availability of drugs, including factors affecting it.

Books Recommended:(Latest editions)

1. Remington's pharmaceutical sciences.
2. Testing of raw materials used in (1).
3. Evaluation of surgical dressings.
4. Sterilization of surgical instruments, glassware and other hospital supplies.
5. Handling and use of data processing equipments.

ENVIRONMENTAL STUDIES

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various c o nt r o l measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

1. Introduction (04 Periods)
   - 1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)
   - 2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)
   - 3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD.

Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)
   - 4.1 Sources of soil pollution
   - 4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
   - 4.3 Effect of Solid waste
   - 4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)
   Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)
   Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)
   Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT

SEMESTER – I

BBA-101: Business Organisation
BBA-102: Business Mathematics
BBA-103: Principles of Economics
BBA-104: Book Keeping and Basic Accounting
BBA-105: Business Laws
BBA-106: Fundamentals of Management
BBA-107: Business Ethics

SEMESTER – II

BBA-201: Organisation Behaviour
BBA-202: Business Communication
BBA-203: Indian Economy
BBA-204: Business Statistics
BBA-205: Business Environment
BBA-206: Principles of Accounting

SEMESTER – III

BBA-301: Advertising Management
BBA-302: Indian Banking System
BBA-303: Human Resource Management
BBA-304: Marketing Management
BBA-305: Company Accounts
BBA-306: Company Law

SEMESTER – IV

BBA-401: Consumer Behaviour
BBA-402: Financial Management
BBA-403: Production Management
BBA-404: Sales Management
BBA-405: Research Methodology
BBA-406: Operation Research

SEMESTER – V

BBA-501: Managerial Economics
BBA-502: Entrepreneurship & Small Business Management
BBA-503: Income Tax
BBA-504: Cost and Management Accounting
BBA-505: Industrial Law
BBA-506: Fundamentals of Computer

SEMESTER – VI

BBA-601: International Trade
BBA-602: Strategic Management & Business Policy
BBA-603: Vat & Service Tax
BBA-604: Management Information System
BBA-605: Auditing
BBA-606: Fundamental of E-Commerce

QUALIFYING PAPER

BBA-008: Environmental Studies

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – I

BBA-101: **BUSINESS ORGANISATION**

Unit – I : Meaning and definition of business essentials & scope of business Classification of Business Activities, Meaning, Definition, Characteristics and objectives of Business Organisation, Evolution of Business Organisation . Modern Business, Business & Profession.

Unit – II : Business Unit, Establishing a new business unit. Meaning of Promotion. Features for business, Plant location, Plant Layout & size of business unit.

Unit – III : Forms of Business Organisation. Sole Proprietorship, Partnership, Joint Stock Companies & Co-operatives.

Unit – IV : Business Combination Meaning Causes, Objectives, Types and Forms Mergers, Takeovers and Acquisitions.

Unit – V : Business Finance: Financial need of Business methods & sources of finance. Security Market, Money Market, Study of Stock Exchange & SEBI.

Suggested Readings:

1. Chottorjee S.K. Business Organisation
2. Jagdish Prakash Business Organistaton and Management
3. Om Prakash Business Organisation
4. Sherlekar S.A. Business Organisation and Management
5. Singh & Chhabra Business Organisation

BBA-102: BUSINESS MATHEMATICS

Unit – I : Matrix: Introduction, Square Matrix, Row Matrix, Column Matrix, Diagonal Matrix, Identity Matrix, Addition, Subtraction & Multiplication of Matrix, Use of Matrix in Business Mathematical Induction

Unit – II : Inverse of Matrix, Rank of Matrix, Solution to a system of equation by the adjoint matrix methods & Guassian Elimination Method.

Unit – III : Percentage, Ratio and Proportion, Average, Mathematical Series-Arithmetic, Geometric & Harmonic, Simple Interest & Compound Interest.

Unit – IV : Set theory- Notation of Sets, Singleton Set, Finite Set, Infinite Set, Equal Set Null Set, Subset, Proper Subset, Universal Set, Union of Sets, Inter-section of Sets, Use of set theory in business, Permutation & Combination

Unit – V : Concept of Differentiation and Integration, Maxima and Minima in Differentiation, Application of Differentiation & Integration in Business (No proof of theorems. Etc)

Suggested Readings:

1. Mehta & Madnani Mathematics for Economics
2. Mongia Mathematics for Economics
3. Zamiruddin Business Mathematics
4. Raghavachari Mathematics for Management

BBA-103: PRINCIPLES OF ECONOMICS

Unit – I : Definition, Nature, Scope & Limitation of Economics as an art or Science. Relevance of Economics in Business Management, Utility analysis, Marginal Theory of utilities and Equi-Marginal theory of utility.

Unit – II : Meaning of demand. Demand theory and objectives, Demand analysis. Demand schedule. Demand Curve and Nature of Curves, Laws of Demand Elasticity of Demand Types & Measurement, Indifference curves analysis Consumer Equilibrium & Consumer Surplus. Price, Income and substitution effect.

Unit – III : Production-Meaning and Analysis Production function. Laws of production, Laws of increasing returns & Laws of constant returns. Equal product curves and Producer equilibrium.

Unit – IV : Market analysis-Nature of market, Types of markets and their characteristics Pricing under different market structures-Perfect Monopoly, oligopoly and Monopolistic completion. Price discrimination under monopoly competition.

Unit – V : Theories of factor pricing, factor pricing v/s product pricing. Theories of rent theories of interest theories of wages theories of profit, Concept of profit maximization

Suggested Readings:

1. Adhjkari M Management Economics
2. Gupta G.S. Managerial Economics
3. Lal S.M. Principles of Economics
4. Vaish & Sunderm Principles of Economics

BBA-104: BOOK KEEPING AND BASIC ACCOUNTING

Unit – I : Meaning of book keeping. Process of book keeping and accounting, Basic terminology of accounting, subsidiary books of accounts, Difference between accounting & book keeping. Importance & Limitations of Accounting, Various users of Accounting Information, Accounting Principles, conventions & Concepts.

Unit – II : Accounting Equation, Dual Aspect of Accounting Types of accounting Rules of debit & Credit, Preparation of Journal and Cash book including banking transaction, Ledger and Trial balance.

Unit – III : Rectification of errors preparation of bank reconciliation Statement, Bills of Exchange And promissory notes.

Unit – IV : Valuation of stocks, Accounting treatment of depreciation. Reserve and provision, Preparation of final accounts along with adjustment entries.

Unit – V : Issue of shares and debentures, Issue of bonus shares and right issue, Redemptioment preference shares and debentures.

Suggested Readings:

1. Agarwal B.D. Advanced Accounting
2. Chawla & Jain Financial Accounting
3. Chakrawarti K.S. Advanced Accounts.
4. Gupta R.L. & Radhaswamy Fundamentals of Accounting
5. Jain & Narang Advanced Accounts
6. Shukla & Grewal Advanced Accounts

BBA-105: BUSINESS LAWS

Unit – I : Indian Contract Act: Definition and essentials, Contracts agreements, Offer & Acceptance Consideration, Capacity of parties Free Consent, Performance of Contracts, Terminal of Contract, Consequence and Remedies of Contract terminal.

Unit – II : Contingent contract, Implied, Quasi contract, Indemnity Contract, Guarantee contract, Bailment, Lien, Pledge contract, Agency contract.

Unit – III : Sales of Goods Act: Sale contract-Definition, Features, Formation of Contract Contents of sale contract-Goods, Price, Condition and Warranty, Ownership of goods and transfer, Performance of sale contract, Delivery, Rights of unpaid sellers, Auction Sale.

Unit – IV : Indian Partnership Act: Definition and Nature of Partnership, Partnership deed Mutual and Third parties relation of Partners, Registration of Partnership Dissolution of Partnership.

Unit – V : Definition Features Types Recognition And Endorsement of Negotiable Instruments.

Suggested Readings:

1. Dhanda PMV Commercial and Industrial Laws
2. Kapoor D Elements of Mercantile law (including Companing Law Industrial Law)
3. Gulshan S and Kapoor Lectures on Business & Economics Laws
4. Kuchall Business Laws
5. Mandal C. Economics and other Legislations

BBA-106: FUNDAMENTALS OF MANAGEMENT

Unit – I : Introduction Concepts, Objectives, Nature Scope and significance of management Evolution of management thought-Contribution Taylor, Weber and Fayol management.

Unit – II : Planning: Concept, Objectives, Nature, Limitation, Process of planning, Importance, Forms, Techniques and Process of decision making.

Unit – III : Organizing: Concept, Objectives, Nature of organizing, Types of Organization, Delegation of authority, Authority and responsibilities, Centralization and Decentralization Span of Control.

Unit – IV : Directing: Concept, Principles & Techniques of directing and Coordination Concept of leadership-Meaning. Importance, Styles, Supervision, Motivation Communication.

Unit – V : Controlling: Concept, Principles, Process and Techniques of Controlling, Relationship between planning and controlling.

Suggested Readings:

1. Pagare Dinkar Principles of Management
2. Prasad B M L Principles and Practice of Management
3. Satya Narayan and Raw VSP Principles and Practice of Management
4. Srivastava and Chunawalla Management Principles and Practice

BBA-107: BUSINESS ETHICS

Unit – I : Business Ethics- An overview-Concept, nature, evolving ethical values, Arguments against business Ethics.

Unit – II : Work life in Indian Philosophy: Indian ethos for work life, Indian values for the work place, Work-life balance.

Unit – III : Relationship between Ethics & Corporate Excellence-Corporate Mission Statement, Code of Ethics, Organizational Culture, TQM.

Unit – IV : Gandhian Philosophy of Wealth Management-Philosophy of Trusteeship, Gandhiji's Seven Greatest Social Sins

Unit – V : Corporate Social Responsibility-Social Responsibility of business with respect to different stakeholders, Arguments for and against Social responsibility of business, Social Audit.

Suggested Readings:

1. Koltar, Philip Marketing Management
2. Stanton, Etzel Walker, Fundamentals of Marketing
3. Saxena Rajan Marketing Management
4. McCarthy, FJ Basic Marketing

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – II

BBA-201: ORGANISATION BEHAVIOUR

Unit – I : Introduction, nature and scope of OB, Challenges and opportunities for OB, Organization Goals, Models of OB, Impact of Global and Cultural diversity on OB.

Unit – II : Individual Behavior - Individual behavior, Personality, Perception and its role in individual decision making, Learning, Motivation, Hierarchy of needs theory, Theory X and Y, Motivation- Hygine theory, Vrooms Expectancy theory

Unit – III : Behavior Dynamics: Interpersonal behavior, Communication, Transaction Analysis, The Johari Window, Leadership, Its Theories and Prevailing Leadership styles in Indian Organisations.

Unit – IV : Group Behavior: Definition and classification of Groups, Types of Group Structures, Group decision making, Teams Vs Groups, Contemporary issues in managing teams, Inter group problems in organizational group dynamics, Management of conflict.

Unit – V : Management of Change: Change and Organisational development, Resistance to change, Approaches to managing organizational change, Organisational effectiveness, Organisational culture, Power and Politics in Organisational Quality of work life, Recent advances in OB.

Suggested Readings:

1. Bennis, W.G. Organisation Development
2. Breech Islwar Oragnaistion-the frame-Work of Management
3. Dayal, Keith Organisational Development
4. Sharma, R.A. Organisational Theory and Behavior
5. Prasad, L.M. Organisational Behavior

BBA-202: BUSINESS COMMUNICATION

Unit – I : Meaning and objective of Business communication, Forms of Communication, Communication model and process, Principles of Effective Communication

Unit – II : Corporate Communication: Formal and Informal Communication, Networks, Grapevine, Barriers in Communication, Groups discussion, Mock Interviews, Seminars, Individual and Group Presentations

Unit – III : Essential of effective Business letters, Writing Important Business letters including correspondence with Bank and Insurance companies.

Unit – IV : Oral & Non-verbal communication: Principles of Oral Presentation Factors affecting Presentation, effective Presentation skills, conducting Surveys.
Body Language, Para Language, Effective Listening, Interviewing skill, Writing resume and Letter or application

Unit – V : Modern forms of communication, International communication, Cultural sensitiveness and cultural context, Writing and presenting in international situations.

Suggested Readings:

1. Bapat & Davar A Text book of Business Correspondence
2. Bhende D.S. Business Communication
3. David Berio The Process of Communication
4. Gowd & Dixit Advance Commercial Correspondence
5. Gurky J.M. A reader in human communication

BBA-203: INDIAN ECONOMY

Unit – I : Meaning of Economy, Economic growth & development, characteristics of India Economy, Concepts of Human development, Factors affecting economic development.

Unit – II : An overview of Economic Resources of India, Human Resources of India: Concept of Population Explosion Interrelation of Population and economic development, Population policy of India, Problem of Unemployment in India.

Unit – III : Economic planning in India; Planning commission, Critical evaluation of current Five Year Plan.

Unit – IV : Problems and prospects of Indian Agriculture, agriculture development during plan period. Position, Problems and Prospects of Large Scale Industries. (Iron, Steel, Sugar, Cotton, Textile)

Unit – V : Service and Entrepreneurial Sector, role of Commercial Bank and Financial Institutions, Role of Small Scale Industries in Indian Economy.

Suggested Readings:

1. Kenes J.M. General Theory of Employment, Interest and Money
2. Brooman Macro Economics
3. Seth, M..L. Monetary Theory
4. Vaish, M.C. Monetary Theory
5. Singh, S.P. Macro Economics

BBA-204: BUSINESS STATISTICS

Unit – I : Statistics: Concept, significance & Limitation Type of Data, Classification & Tabulation, Frequency Distribution & graphical representation.

Unit – II : Measures of Central Tendency (Mean, Medium, Mode) Measures of Variation: Significance & Prosperities of a good measure of variation: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Measures of Skewness & Kurtosis.

Unit – III : Correlation: Significance of Correlation, Types of correlation, Simple correlation, Scatter Diagram method, Karl Pearson Coefficient of Correlation. Regression: Introduction, Regression lines, and Regression Equation & Regression coefficient.

Unit – IV : Probability: Concept, Events, Addition Law, Conditional Probability, Multiplication Law & Baye's theorem [Simple numerical], Probability Distribution: Binomial, Poisson and Normal.

Unit – V : Sampling Method of sampling, Sampling and Non-sampling errors. Test of Hypothesis, Type- I and Type -II Errors, Large sample tests

Suggested Readings:

1. Gupta, S.P. & Gupta, M.P. Business Statistics
2. Levin, R.I. Statistics for Management
3. Feud, J.E. Modern Elementary Statistics
4. Elhance, D.N. Fundamentals of Statistics
5. Gupta, C.B. Introduction of Stastical Methods

BBA-205: BUSINESS ENVIRONMENT

Unit – I : Concept, Significance, Components of Business environment, Factor affecting Business Environment, Social Responsibilities of Business.

Unit – II : Economic Systems: Capitalism, Socialism, Communism, Mixed Economy-Public Sector & Private Sector

Unit – III : Industrial Policy -Its historical perspective (In brief); Socio-economic implications of Liberalisation, Privatisation, Globalisation.

Unit – IV : Role of Government in Regulation and Development of Business; Monetary and Fiscal Policy; EXIM Policy, FEMA

Unit – V : Overview of International Business Environment, Trends in World Trade: WTO- Objectives and role in international trade.

Suggested Readings:

1. Francis Cherunilum Business Environment
2. K.Aswathapa Business Environment

BBA-206: PRINCIPLES OF ACCOUNTING

Unit – I : Accounting standards in India, Concept of GAAP (Generally Accepted Accounting Principles) International Accounting Standards, Accounting for Price level changes.

Unit – II : Accounting of Non-trading Institutions, Joint Venture an Consignment.

Unit – III : Accounts of banking companies and General Insurance companies, Department and Branch account.

Unit – IV : Accounts related to Hire Purchase and Installment payment transactions, Royalty Accounts

Unit – V : Partnership Accounts: Final Account, Reconstitiution of Partnership firms-admission, retirement and death of a partner, Dissolution of Partnership (Excluding insolvency of Partner).

Suggested Readings:

1. Agarwal, B.D. Advanced Accounting
2. Chawla & Jain Financial Accounting
3. Chakrawarti, K.S. Advanced Accounts
4. Shukla, M.B. Financial Analysis and Business Forecasting
5. Jain & Naranag Advanced Accounts

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – III

BBA-301: ADVERTISING MANAGEMENT

Unit – I : Advertising: Introduction, Scope, importance in business: Role of advertising in social and economic development of India: Ethics and truths in Indian Advertising.

Unit – II : Integrated Communication Mix (IMC)-meaning, importance; Communication meaning, importance, process, communication mix-components, role in marketing, Branding-meaning, importance in advertising.

Unit – III : Promotional objectives - importance determination of promotional objectives, setting objective DAGMAR; Advertising Budget importance, establishing the budget-approaches allocation of budget.

Unit – IV : Advertising Copy-meaning components types of advertising copy, importance of creativity in advertising; Media planning-importance, strategies, media mix.

Unit – V : Advertising research - importance, testing advertising effectiveness market testing for ads; International Advertising-importance, international Vs local advertising.

Suggested Readings:

1. Advertising and Promotion George E. Beich & Michael A. Belch. T.M.H.
2. Advertising Management, Concept and Cases Manendra Mohan, TMH
3. Advertising Management Rajeev Batra, PHI

BBA-302: INDIAN BANKING SYSTEM

Unit – I : Indian Banking System : Structure and organization of banks; Reserve bank of India; Apex banking institutions; Commercial banks; Regional rural banks; Co-operative banks; Development banks.

Unit – II : State Bank of India: Brief History; Objectives Functions; Structure and organization; Working and progress.

Unit – III : Banking Regulation Act, 1949: History; Social Control; Banking Regulation Act as applicable to banking companies and public sector banks; Banking Regulation Act as applicable to Cooperative banks.

Unit – IV : Regional Rural and Co-operative banks in India: Functions; Role of regional rural and co-operative bank in rural India; Progress and performance.

Unit – V : Reserve Bank of India; Objectives; Organization; functions and working; monetary policy credit control measures and their effectiveness.

Suggested Readings:

1. Basu A.K. : Fundamentals of banking- Theory and Practice; A. Mukherjee and Co., Calcutta
2. Sayers R.S. : Modern Banking; Oxford University, Press.
3. Panandikar, S.G. and Mithani D.M.: Banking in India; Orient Longman
4. Reserve Bank of India : Functions and Working
5. Dekock : Central Banking; Crosby Lockwood Staples, London
6. Tennan M.L.: Banking-Law and Practice in India; India law House, New Delhi.

BBA-303: HUMAN RESOURCE MANAGEMENT

Unit – I : Introduction to HRM & HRD Concept of HRM, Objectives, Process, HRM vs. Personnel Management, HRM Vs. HRD, Objectives of HRD, focus of HRD System, Structure of HRD System, role of HRD manpower.

Unit – II : Human Resource Policies & Strategies Introduction, role of HR in strategic management, HR policies & Procedures, HR Programme., developing HR policies and strategies, Strategic control, Types of Strategic control, Operational Control System, Functional and grand strategies, Strategy factors.

Unit – III : Human Resource Procurement & Mobility Productivity & improvement job analysis & Job design, work measurement, ergonomics. Human Resource planning-objectives, activities, manpower requirement process Recruitment & Selection Career planning & development, traning methods, basic concept of performance appraisal. Promotion & Transfer.

Unit – IV : Employee Compensation Wage policy, Wage determination, Wage boar, factors affecting wages & Salary, systems of payments, Job evaluation, components of wage/salary-DA, incentives, bonus, fringe benefits etc., Minimum Wages Act 1948, Workmen Compensation Act 1923, Payment of bonus Act 1965.

Unit – V : Employee relations Discipline & Grievance handling types of trade unions, problems of trade unions

Suggested Readings:

1. Human Resource Management - Dipak Kumar Bhattacharya
2. Managing Human Resource-Arun Monappa
3. Essential of HRM and Industrial Relations-P.Subba Rao
4. Personnel Management-C.B. Memoria

BBA-304: MARKETING MANAGEMENT

Unit – I : Marketing: Definition, nature, scope & importance, Marketing Management, Core concepts of marketing, selling concept, production concept, modern marketing concept, Societal marketing.

Unit – II : Segmentation: Concept, basis of segmentation, Importance in marketing; Targeting: Concept Types, Importance; Positioning: Concept, Importance, Brand positioning, Repositioning.

Unit – III : Marketing Mix:
Product: Product Mix, New Product development, levels of product, types of product, Product lofe cycle, Branding and packaging.
Distribution: Concept, importance, different types of distribution channels etc.

Unit – IV : Price: Meaning, objective, factors influencing pricing, methods of pricing.
Promotion: Promotional mix, tools, objectives, media selection & management.

Unit – V : Marketing Research: Importance, Process & Scope Marketing Information Systems: Meaning Importance and Scope Consumer Behavior: Concept, Importance and factors influencing consumer behavior.

Suggested Readings:

1. Marketing Mgt. by Philip Kotlar (PHI)
2. Marketing by Etzet, Walker, Stanton
3. Marketing Management by Rajan Saxena

BBA-305: COMPANY ACCOUNTS

Unit – I : Joint Stock Companies- its types and share capital, Issue, Forfuture and Re-issue of shares, Redemption of preference shares, Issue and Redemption of Debenture.

Unit – II : Final Accounts: Including Computation of managerial Remuneration and disposal of profit.

Unit – III : Accounting for Amalgamation of companies as per Accounting Standard 14 Accounting for Internal reconstruction.

Unit – IV : Consolidated Balance Sheet of Holding Companies with one Subsidiary Only.

Unit – V : Liquidation of Company, Statement of Affairs and Deficiency/Surplus, Liquid for final statement of A/c Receivers Receipt and Payment A/c.

Suggested Readings:

1. Gupta R.L. Radhaswamy M, Company Accounts, Sultan chand &
2. Maheshwari, S.N., Corporate Accounting, Vikas Publishing
3. Monga J.R., Ahuja, Girish, and Sehgal Ashok, Financial Accounting
4. Shukla, M.C., Grewal T.s. and Gupta, S.C. Advanced Accounts, S. Chand & Co.
5. Moore C.L. and Jaedicke R.K., Management Accounting

BBA-306: COMPANY LAW

Unit – I : Corporate Personality: Kinds of Company, Promotion and Incorporation of Companies.

Unit – II : Memorandum of Association, Articles of Association Prospectus.

Unit – III : Shares; Share Capital, Members, Share Capital- Transfer and Transmission, Directors-Managing Director, Whole Time Director.

Unit – IV : Capital Management-Borrowing powers, mortgages and charges, debentures, Company Meetings-kinds quorum, voting resolutions, minutes.

Unit – V : Majority Powers and minority Rights Prevention of oppression and mismanagement, winding up-Kinds and Conduct.

Suggested Readings:

1. Grower L.C.B. Principles of Modern Company Law, Stevens & Sons, London
2. Ramaiya A. Guide to the Companies Act. Wadhwa & Co., Nagpu
3. Singh, Avtar Company Law, Eastern Book Co. , Lucknow
4. Kuchal, M.C. Modern Indian Company Law, Sri Mahavir Books, Noida
5. Kapoor, N.D. Company Law- Incorporating the Provisions of the Companies Amendment Act, 2000, Sultan & sons

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – IV

BBA-401: CONSUMER BEHAVIOUR

Unit – I : Introduction to consumer Behavior (CB)- Importance, Scope, need for studying CB, Consumer research process.

Unit – II : Consumer models: Economic model, Psychoanalytic model, Sociological model, Howard & Seth model, Nicosia model, Engel-kollat-Blackwell model.

Unit – III : Individual determinates: Perceptual process, consumer learning process, consumer attitude formation, attitude measurement, meaning and nature of personality, self concept.

Unit – IV : Influences & Consumer Decision making : Family, reference group, personal, social and cultural influence on CB, Consumer Decision making process, Consumer Communication process, consumer satisfaction.

Unit – V : Industrial Buying Behaviour : Participants, characteristics of industrial markets, factors influencing industrial markets, stages of industrial buying process, Customer and marketing of services.

Suggested Readings:

1. Consumer Behaviour in Indian Perspective Suja. R. Nair
2. Consumer Behaviour Schifman & Kanuk
3. Consumer Behaviour Louden & Bitta
4. Consumer Behaviour Bennet & Kasarjian

BBA-402: FINANCIAL MANAGEMENT

Unit – I : Introductory: Concept of Financial management, Finance functions, objectives of financial management- Profitability vs. shareholder wealth maximization. Time value of Money-Compounding & Discounting.

Unit – II : Capital Structure Planning: capitalization Concept, basis of capitalization, consequences and remedies of over and under capitalization. Determinants of Capital structure, Capital structure theories.

Unit – III : Management of Fixed Capital: Cost of Capital, Nature & Scope of Capital budgeting-payback NPV, IRR and ARR methods and their practical applications. Analysis of risk & uncertainty.

Unit – IV : Management of Working Capital: Concepts of working Capital, Approaches to the financing of current Assets determining capital (with numerical problems) Management of different components of working capital.

Unit – V : Management of Earning: Concept & relevance of Dividend decision. Dividend Models-Water, Gordons, MM Hypothesis. Dividend policy-determinants of dividend policy.

Suggested Readings:

1. Financial Management S.N. Maheshwari
2. Financial Management Khan & Jain

BBA-403: PRODUCTION MANAGEMENT

Unit – I : Nature & Scope of Production Management, Functions of Production Management, Production Systems, responsibilities of Production manager. Production Planning & Control (PPC), Objectives of PPC.

Unit – II : Types of manufacturing Systems: Intermitted & Continuous Systems etc., Product design & development.

Unit – III : Plant Location & Plant layout.

Unit – IV : Materials Management & Inventory Control : Purchasing Economic lot quality/Economic order quantity(EOR), Lead time, Rorder level. Brief of ABC analysis, Stock Keeping. Quality

Unit – V : Control: Quality, Quality assurance, Quality Circles, TQM, JIT, Statistical Quality Control

Suggested Readings:

1. Production Operation management B.S. Goel
2. Production &. Operation Management Buffa
3. Production & Operation Management S.N Chany

BBA-404: SALES MANAGEMENT

Unit – I : Sales Management :
- Evolution of sales function
- Objectives of sales management positions - Functions of Sales executives
- Relation with other executives

Unit – II : Sales Organisation and relationship: - Purpose of sales organization - Types of sales organization structures - Sales department external relations Distributive network relations.

Unit – III : Salesmanship :
- Theories of personal selling
- Types of Sales executives
- Qualities of sales executives
- Prospecting, pre-approach and post-approach- Organising display, showroom & exhibition

Unit – IV : Distribution network Management
- Types of Marketing Channels
- Factors affecting the choice of channel
- Types of middleman and their characteristics
- Concept of physical distribution system Sales

Unit – V : Force Management
- Recruitment and Selection
- Sales Training
- Sales Compensation

Suggested Readings:

1. Sales Management -Cundiff, Still, Govoni
2. Salesmanship & Publicity -Pradhan, Jakate, Mali
3. Sales Management -S.A. Chunawalla

BBA-405: RESEARCH METHODOLOGY

Unit – I : Introduction - Meaning of Research ; Objectives of Research; Types of Research; Research Process; Research Problem formulation.

Unit – II : The Design of Research-Research Design; Features of a Good design; Different Research Designs ; Measurement in Research; Data types; Sources of Error.

Unit – III : Sampling Design- Census & Sample Surveys; Steps in Sampling Design; Types of Sample designs-Probability & Non Probability sampling.

Unit – IV : Processing & Analysis of Data- Processing operations; problems in processing; types of analysis Hypothesis Testing-Chi-square test, Z test, t-test, f-test.

Unit – V : Presentation- Diagrams; graphs; chars. Report writing; Layout of Research report; Types of Reports; Mechanism of writing a Research report; Precaution for writing report.

Suggested Readings:

1. Research Methodology C.R. Kothari

BBA-406: OPERATION RESEARCH

Unit – I : Nature, Definition & characteristics of operations research, Methodology of DR, Models in OR; OR & managerial Decision making, OR techniques.

Unit – II : Linear programming: Introduction, Advantages of Linear Programming, Applications areas of Linear Programming. LPP-problem formulation, Graphic Method, Simplex Method (including Big M method)

Unit – III : Transportation-North West Corner Rule, matrix Minima & VAM Methods, Degenerating, MODI Method. Assignment Problems

Unit – IV : Decision making under Uncertainty-Criteria of Maximax, maximin, Maximax Regret, laplace & Hurwinz. Decision making under Risk-Criteria of EMV & EOL, Decision Tree approach & its applications.

Unit – V : PERT & CPM-Introduction, Network Analysis, Time Estimates in Network Analysis, Critical Path Method; Programme Evaluation & Review Technique.

Suggested Readings:

1. Operation Research V.K. Kapoor

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – V

BBA-501: MANAGERIAL ECONOMICS

Objective: The Basic objective of this course is to familiarize the students with the concepts and tools of managerial Economics as applicable to decision making in contemporary business environment.

Unit – I : Nature and Scope: Nature and Scope of Managerial Economics, its relationship with other subjects. Fundamental Economic Tools-Opportunity cost concept, Intermental concept, Principle of time perspective, Discounting principle and Equimarginal principle.

Unit – II : Demand Analysis: Concept and importance of Demand & its determinants Income & Substitution effects. Various elasticities of demand, using elasticities in managerial decisions, revenue concepts, and relevance of demand forecasting and methods of demand forecasting.

Unit – III : Cost Concept: Various cost concepts and classification, Cost output relationship in short run & long run cost curves). Economics and diseconomies of scale, Cost control and Cost reduction, Indifferent curves.

Unit – IV : Pricing: Pricing methods, Price and output decisions under different market structures-perfect competition, Monopoly and Monopolistic Competition, Oligopoly.

Unit – V : Profit Management & Inflation: Profit, Functions of profit, Profit maximization, Break Even analysis. Elementary idea of Inflation.

Suggested Readings:

1. Varsney & Maheshwari Managerial Economics
2. Mote Paul & Gupta Managerial Economics : Concepts & Cases
3. D.N.Dwivedi Managerial Economics
4. D.C.Huge Managerial Economics
5. Peterson & Lewis Managerial Economics
6. Trivedi Managerial Economics
7. D.Gopalkrishnan A Study of Managerial Economics

BBA-502: ENTREPRENEURSHIP & SMALL BUSINESS MANAGEMENT

Objective: The objective of the course is to familarise the students with the basic concepts of entrepreneurship.

Unit – I : Name & Scope Role & Importance in Indian Economy, Theories of Entrepreneurship traits of entrepreneur, entrepreneurs Vs professional managers, problems faced by entrepreneurs.

Unit – II : Entrepreneurial Development Entrepreneurial Development, Significance and role of environment infrastructural network, environmental analysis, E.D. programmes (EDP), problems of EDP.

Unit – III : Transportation-North West Corner Rule, matrix Minima & VAM Methods, Degenerating, MODI Method. Assignment Problems

Unit – IV : Project & Reports Search for business idea, transformation of idea into reality: projects and classification. Identification of projects, project design and network analysis, project appraisal plant layout.

Unit – V : Small industry setup Types of organization-sole proprietorship, partnership, joint stock company, co-operative organization, their merits, limitations, suitability. Organisational locations, steps in starting a small industry, incentives and subsidies available, export possibilities.

Suggested Readings:

1. Entrepreneruship Development Vasant Desai

BBA-503: INCOME TAX

Objective- It enables the student to know the basics of Income Tax and its implications.

Unit – I : Basic Concept: Income, Agriculture Income, Casual Income, Assessment Year. Previous Year. Gross Total Income, Total Income, Person, Tax Evasion, Avoidance and Tax Planning.

Unit – II : Basis of Charge: Scope of Total Income, Residence and Tax Liability, Income which does not form part of Total Income.

Unit – III : Heads of Income: Income from Salaries, Income from House Properties.

Unit – IV : Heads of Income: Profit and Gains of Business or Profession, Including Provisions relating to specific business, Capital Gains, Income from other sources.

Unit – V : Aggregation of Income, Set off and Carry forward of losses, deduction from gross total Income.

Suggested Readings:

1.Mehrotra,H.C. Income Tax Law and Account

2.Prasad, Bhagwati Income Tax Law and Practice 3.Chandra Mahesh and Shukla D.C. Income Tax Law and Practice 4.Agarwal,B.K. Income Tax

5.Jain,R.K. Income Tax

BBA-504: COST AND MANAGEMENT ACCOUNTING

Unit – I : Introduction: Nature and Scope of Cost Accounting, Cost, concepts and Classification, Methods and Techniques, Installation of Costing System.

Unit – II : Accounting for Material, Labour and Overheads.

Unit – III : Element of Cost, Assessment of Cost-Preparation of Cost Sheet and Statement of Cost.

Unit – IV : Management Accounting - Meaning, Nature, Scope, Functions Relationship of Management Accounting, Financial Accounting and Cost Accounting.

Unit – V : Marginal Costing and Absorption Costing.

Suggested Readings:

1. Maheshwari S.N. : Advanced Problem and Solutions in Cost Accounting
2. Khan & Jain : Management Accounting
3. Gupta, S.P. : Management Accounting

BBA-505: INDUSTRIAL LAW

Unit – I : Factory act 1948.

Unit – II : Workmen compensation act 1923

Unit – III : Industrial dispute act 1947, Minimum wages act 1948

Unit – IV : Employee state insurance act 1948.

Unit – V : Employee provident fund act 1952 Payment of gratuity act 1972.

Suggested Readings:

1. Element of industrial law N D Kapoor

BBA-506: FUNDAMENTALS OF COMPUTER

Unit – I : History of computing, Characteristics of computers, Limitations of computers, Basic computer organization, Generations of computers.

Unit – II : Input-Output Devices : Keyboard, Mouse, Light pen, touch screens, VDU, Scanners, MICR, OCR, OMR, Printers and its type, Plotters, Microfilm, Microfiche, Voice Recognition and Reponse Devices.

Unit – III : Storage Devices : Primary and Secondary Storage devices- RAM, ROM, Cached Memory, Registers, Storage Concept, Hard disk, Floppy disk, CD-ROM, Magnetic tapes and cartridges, comparison of sequential and direct- Access devices.

Unit – IV : Computer Software : Relationship between hardware and software, Computer languages-Machine language Assembly language, High-level languages, Compliers & interpreters, Characteristics of good language.

Unit – V : Operating System & Internet: Definition and functions of O.S. Batch Processing, Multipurpossing, Multiprogramming, time sharing, On-line process, Real time process. Introduction to window-98, Internet & its uses, terminology of internet, Browser, Search engines, E-Mail, Video conferencing.

Suggested Readings:

1. Computer Fundamental — Sinha, P.K.
2. Fundamentals of Computers — Jain, V.K.
3. Operating System — Godbole, G.B.
4. Window-98 — Manual
5. Internet — Leon & Leon

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – VI

BBA-601: INTERNATIONAL TRADE

Unit – I : Basics of international trade: Basics of international trade, international trade theories, drivers of international trade, restraining forces, recent trends in world trade.

Unit – II : Foreign trade & economic growth: Foreign trade & economic growth, balance of trade, balance of payments, free trade, forms and restrictions.

Unit – III : International economic institutions: International economic institutions, IMF, World Bank, WTO (in brief), Regional economic groupings NAFTA, EU, ASEAN, SAARC.

Unit – IV : Recent trends in India's foreign trade: Recent treds in India's foreign trade, institutional infrastructure for export promotion in India, projects & consultancy exports.

Unit – V : India's Trade Policy: India's Trade policy, export assistance, marketing plan for exports.

Suggested Readings:

1. Varshney & Bhattacharya : International Marketing

BBA-602: STRATEGIC MANAGEMENT & BUSINESS POLICY

Unit – I : Nature & importance of Business Policy, Development & Classification of Business Policy; Mechanism or Policy making.

Unit – II : Responsibilities & tasks of Top Management: objectives of Business Characteristics, Classification, Types of objectives and their overall Hierachy, Setting of objectives, Key areas involved.

Unit – III : Corporate Planning; Concept of long term planning, Strategic Planning, Nature, Process & Importance.

Unit – IV : Corporate Strategy: Concept, Components, Importance, and Strategy Formulation: Concept, Process & Affecting Factors. Strategy Evaluation: Process, Criteria, Environmental Analysis, Resource Analysis

Unit – V : Concept of Synergy: Types, Evaluation of Synergy. Capability Profiles, Synergy as a Component of Strategy & its relevance

Suggested Readings:

1. Peter F. Drucker Management Task & Responsibilities
2. Igor Ansoff Corporate Strategy
3. Gluek & Jaunch Corporate Strategy
4. Hatton & Hatton Strategic Management
5. Christian, Anderson, Bower Business Policy
6. McCarthy, IninChiello, Curran Business Policy & Strategy
7. Azhar Kazmi Business Policy
8. Stanford ManagementPolicy

BBA-603: VAT & SERVICE TAX

Unit – I : Legislative background, Basic concept of VAT-white paper on VAT, Report of Empowered Committee of State Finance Ministers, constitutional provisions, liability under VAT, Importance Definition under VAT, Difference between Sales Tax System and VAT

Unit – II : Computation(VAT Variants), Procedural aspects including registration, Rates of tax, Assessment, Input Tax Credit, Filling of Returns, Refunds, Audit, Appeals, Revision and Appearances.

Unit – III : Appointment, jurisdiction and powers of authorities under VAT, Concept of VAT on Services, Central Sales Tax; Goods and Service Tax.

Unit – IV : Background, Statutory provisions, Taxable services, valuation, administrative mechanism and registration under service tax, rate and computation of service tax.

Unit – V : Assessment, levy, collection and payment of service tax, exemptions, CENVAT credit for service tax, Filing of Returns, Appeals, Revisions.

Suggested Readings:

1. Systematic Approach to Income Tax, Dr. Girish Ahuja and Dr. Ravi Gupta
   Bharat law House.
2. Indirect Taxes law and Practice, V.S. Datey, Taxman
3. Income Tax, Dr. V.K. Singhania, Taxman

BBA-604: MANAGEMENT INFORMATION SYSTEM

Unit – I : Management Information System(MIS): Concept & definition, Role of MIS, Process of Management, MIS-A tool for management process, Impact of MIS, MIS & computers, MIS & the user, IMS- a support to the Management.

Unit – II : Planning & Decision making: The concept of corporate planning, Strategic planning, Type of strategic, Tools of Planning, MIS-Business Planning; Decision making concepts, Methods, tools and procedures, Organizational Decision making, MIS & Decision making concepts.

Unit – III : Information & System: Information concepts, Information: A quality product classification of the information, Methods of data & information collection, Value of information, MIS & System concept, MIS & System analysis, Computer System design.

Unit – IV : Development of MIS: Development of long rage plans of the MIS. Ascertaining the class of information, determining the information requirement, Development and implementation of the MIS, Management of quality in the MIS, organization for development of the MIS, MIS: the factors of success and failure.

Unit – V : Decision Support System (DSS): Concept and Philosophy, DSS: Deterministic Systems, Artificial intelligence(AI) System, Knowledge based expert system(KBES), MIS & the role of DSS, Transaction Processing System(TPS), Enterprise Management System(EMS), Enterprise Resource Planning (ERP) System, Benefits of ERP, EMS & ERP

Suggested Readings:

1. Management Information System, Jawadekar W S
2. Managing with information, Kanter, Jerome
3. Management Information System, Louden & Louden
4. Information system for Modern Management, Murdick & Ross, R.claggetti

BBA-605: AUDITING

Unit – I : Introduction: Meaning and objectives of Auditing, Types of Audit, Internal Audit, Audit Programme, Audit Notebook, Routine Checking and Test Checking.

Unit – II : Internal Check System: Internal Control, audit Procedure: Vouching Verification of Assets and Liabilities.

Unit – III : Audit of Limited Companies: Company Auditor- Appointment, Powers, Duties and Liabilities. Auditor's Report and Audit Certificate.

Unit – IV : Special Audit, Audit of Banking Companies, Audit of Insurance Companies, Audits of Educational Institutions, Audit of Cooperative Societies, Efficiency Audit, Social Audit etc.

Unit – V : Recent trends in Auditing: Nature and Significance of Cost Audit, Tax Audit, Management Audit.

Suggested Readings:

1. BK BasuAn insight with Auditing
2. Kamal Gupta Contemporary Auditing

BBA-606: FUNDAMENTAL OF E-COMMERCE

Unit – I : E-Commerce: Introduction, meaning and concept; Needs and advantages of e-commerce; Traditional commerce; Types of E-Commerce, Basic requirements of E-Commerce.

Unit – II : Internet: Concept & evaluation, Characteristics of Internet: email, WWW. Ftp, telnet, Intranet & Extranet, Limitation of internet, Hardware & Software requirement of Internet, searches Engines.

Unit – III : Electronic Payment Systems: E-Cash, e-cheque, credit cards, debit cards, smart cards, E-Banking, Manufacturing information systems.

Unit – IV : EDI introduction, networking infrastructure of EDI, Functions & Components of EDI File types of EDI.

Unit – V : Security issues of e-commerce: Firewall, E-locking, Encryption; Cyber laws-aims salient provisions; PKI (Public key infrastructure)

Suggested Readings:

1. Frontiers of E-CommerceRavi Kalkota, TMH
2. O, Brien JManagement Information System, TMH
3. Oberoi, Sundeep E-Security and You, TMH
4. Young, Margret Levine The complete reference to Internet, TMH

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

QUALIFYING PAPER

ENVIRONMENTAL STUDIES (CODE-008)

Unit-1: The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance, Need for Public Awareness.

Unit-2: Natural Resources

- Renewable and Non-renewable Resources:

Natural resources and associated problems: -

a) **Forest Resources:** use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) **Water Resources:** use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral Resources:** use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food Resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy Resources:** Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies

f) **Land Resources:** Land as a resource; land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles

Unit-3: Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: -
    a) Forest ecosystem
    b) Grassland ecosystem
    c) Desert ecosystem
    d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-4: Biodiversity And Its Conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-5: Environmental Pollution

Definition:

- Causes, effects and control measures of: -
    a) Air pollution
    b) Water pollution
    c) Soil pollution
    d) Marine pollution
    e) Noise pollution
    f) Thermal pollution
    g) Nuclear pollution

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster Management: Floods, earthquake, cyclone and landslides.

Unit-6: Social Issues And The Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental Ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

Unit-7: Human Population And The Environment

- Population growth, variation among nations.
- Population explosion: Family Welfare Programme.
- Environment and human health
- Human Rights
- Value Education
- Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case Studies

Unit-8: Field Work

- Visit to a local area to document environmental assets-river / forest / grassland / hill / mountain.
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours).

****

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER-I

Course Code	Course Name
BCA-101	Mathematics-I
BCA-102	Programming Principle & Algorithm
BCA-103	Computer Fundamental and Office Automation
BCA-104	Principle of Management
BCA-106	Business Communication
BCA-108	Environmental Studies
BCA-105	Computer Laboratory and Practical Work of Computer Fundamental and Office Automation
BCA-107	Computer Laboratory and Practical Work of Programming Principle & Algorithm

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-101 Mathematics -I

UNIT-I

DETERMINANTS:

Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof).

UNIT-II

LIMITS & CONTINUITY:

Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

UNIT-III

DIFFERENTIATION:

Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Curve Tracing, Successive Differentiation & Liebnitz Theorem.

UNIT-IV

INTEGRATION:

Integral as Limit of Sum, Fundamental Theorem of Calculus(without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions(definition).

UNIT-V

VECTOR ALGEBRA:

Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and physical interpretation of area and volume.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-102 Programming Principle Algorithm

UNIT-I

Introduction to 'C' Language History, Structures of 'C' Programming, Function as building blocks.

Language Fundamentals Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments.

UNIT-II

Operators

Types of operators, Precedence and Associativity, Expression, Statement and types of statements

Build in Operators and function Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar(); Concept of header files, Preprocessor directives: #include, #define.

UNIT-III

Control structures

Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit.

UNIT-IV

Introduction to problem solving

Concept: problem solving, Problem solving techniques (Trail & Error, Brain Stroming, Divide & Conquer) Steps in problem solving (Define Problem, Analyze Problem, Explore Solution) Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an algorithm Conditionals in pseudo-code, Loops in pseudo code Time complexity: Big-Oh notation, efficiency Simple Examples: Algorithms and flowcharts (Real Life Examples)

UNIT-V

Simple Arithmetic Problems

Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n, a^b, Factorial, sine series, cosine series, ${}^nC_r$, Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping

UNIT-VI

Functions

Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-103 Computer Fundamental & Office Automation

UNIT-I

Introduction to Computers

Introduction, Characteristics of Computers, Block diagram of computer.Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers.Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages).Data Organization, Drives, Files, Directories.Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM.

Secondary Storage Devices (FD, CD, HD, Pen drive)

I/O Devices (Scanners, Plotters, LCD, Plasma Display)

Number Systems

Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

UNIT-II

Algorithm and Flowcharts

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples,Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples

UNIT-III

Operating System and Services in O.S.

Dos – History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

UNIT-IV

Windows Operating Environment

Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

UNIT-V

Editors and Word Processors

Basic Concepts, Examples: MS-Word, Introduction to desktop publishing.

UNIT-VI

Spreadsheets and Database packages

Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-104 Principle of Management

UNIT-I

Nature of Management:

Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts of management-Administration-Organization, Management Skills, Levels of Management.

UNIT-II

Evolution of Management Thought:

Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Business Ethics & Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.

UNIT-III

Functions of Management: Part-I

Planning – Meaning- Need & Importance, types, Process of Planning, Barriers to Effective

Planning, levels – advantages & limitations. Forecasting- Need & Techniques

Decision making-Types - Process of rational decision-making & techniques of decision-making

Organizing – Elements of organizing & processes: Types of organizations, Delegation of authority – Need, difficulties Delegation – Decentralization

Staffing – Meaning & Importance, Direction – Nature – Principles, Communication – Types & Importance

UNIT-IV

Functions of Management: Part-II

Motivation – Importance – theories

Leadership – Meaning –styles, qualities & function of leader Controlling - Need, Nature, importance, Process & Techniques, Total Quality Management Coordination – Need – Importance

UNIT – V

Management of Change: Models for Change, Force for Change, Need for Change, Alternative Change Techniques, New Trends in Organization Change, Stress Management.

UNIT-VI

Strategic Management

Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India

Course Code Course Name

BCA-106 Business Communication

UNIT-I

Means of Communication:

Meaning and Definition – Process – Functions – Objectives – Importance – Essentials of good communication – Communication barriers, 7C's of Communication

UNIT-II

Types of Communication:

Oral Communication:

Meaning, nature and scope – Principle of effective oral communication – Techniques of effective speech – Media of oral communication (Face -to-face conversation – Teleconferences – Press Conference – Demonstration – Radio Recording – Dictaphone – Meetings – Rumour – Demonstration and Dramatisation – Public address system – Grapevine – Group Discussion – Oral report – Closed circuit TV). The art of listening – Principles of good listening.

UNIT-III

Written Communication

Purpose of writing, Clarity in Writing, Pricinciple of Effective writing, Writing Techniques, Electronic Writing Process.

UNIT-IV

Business Letters & Reports:

Need and functions of business letters – Planning & layout of business letter – Kinds of business letters – Essentials of effective correspondence, Purpose, Kind and Objective of Reports, Writing Reports.

UNIT-V

Drafting of business letters:

Enquiries and replies – Placing and fulfilling orders – Complaints and follow-up Sales letters – Circular letters Application for employment and resume

UNIT-VI

Information Technology for Communication:

Word Processor – Telex – Facsimile(Fax) – E-mail – Voice mail –Internet – Multimedia – Teleconferencing – Mobile Phone Conversation – Video Conferencing –SMS – Telephone Answering Machine – Advantages and limitations of these types.

Topics Prescribed for workshop/skill lab

Group Discussion, Mock Interview, Decision Making in a Group

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -II

Course Code	Course Name
BCA-201	Mathematics-II
BCA-202	C-Programming
BCA-203	Organization Behavior
BCA-204	Digital Electronics and Computer Organisation
BCA-205	Financial Accounting and Management
BCA-206	Computer Laboratory and Practical Work of C

Course Code Course Name

BCA-201 Mathematics II

UNIT-I

SETS

Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

UNIT-II

RELATIONS AND FUNCTIONS

Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Introduction of Trignometric, Logarithmic and Exponential Functions.

UNIT-III

PARTIAL ORDER RELATIONS AND LATTICES

Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, Glb, lub, Lattices & Algebric Systems, Principle of Duality, Basic Properties, Sublattices, Distributed & Complemented Lattics.

UNIT-IV

FUNCTIONS OF SEVERAL VARIABLES

Partial Differentiation, Change of Variables, Chain Rule, Extrema of Functions of 2 Variables, Euler's Theorem.

UNIT-V

3D COORDINATE GEOMETRY

3D Coordinate Geometry: Coordinates in Space, Direction Cosines, Angle Between Two Lines, Projection of Join of Two Points on a Plane, Equations of Plane, Straight Lines, Conditions for a line to lie on a plane, Conditions for Two Lines to be Coplanar, Shortest Distance Between Two Lines, Equations of Sphere, Tangent plane at a point on the sphere.

UNIT-VI

MULTIPLE INTEGRATION

Double Integral in Cartesian and Polar Coordinates to find Area, Change of Order of Integration, Triple Integral to Find Volume of Simple Shapes in Cartesian Coordinates

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-202 C Programming

UNIT-I

Arrays

Definition, declaration and initialization of one dimensional array; Accessing array elements; Displaying array elements; Sorting arrays; Arrays and function; Two-

Dimensional array: Declaration and Initialization, Accessing and Displaying, Memory representation of array [Row Major, Column Major]; Multidimensional array

UNIT-II

Pointers

Definition and declaration, Initialization; Indirection operator, address of operator; pointer arithmetic; dynamic memory allocation; arrays and pointers; function and pointers

UNIT-III

Strings

Definition, declaration and initialization of strings; standard library function: strlen(), strcpy(), strcat(), strcmp(); Implementation without using standard library functions

UNIT-IV

Structures

Definition and declaration; Variables initialization; Accessing fields and structure operations; Nested structures; Union: Definition and declaration; Differentiate between Union and structure

UNIT-V

Introduction C Preprocessor

Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation

Bitwise Operators

Bitwise operators; Shift operators; Masks; Bit field

UNIT-VI

File handling

Definition of Files, Opening modes of files; Standard function: fopen(), fclose(), feof(), fseek(),

fewind();Using text files: fgetc(), fputc(), fscanf()

Command line arguments

BCA-203 Organization Behavior

Course Code Course Name

UNIT-I

Fundamentals of Organizational Behaviour

Nature, Scope, Definition and Goals of Organizational Behaviour; Fundamental Concepts of Organizational Behaviour; Models of Organizational Behaviour; Emerging aspects of Organizational Behaviour: Meaning Cultural Diversity, Managing the Perception Process

UNIT-II

Perception, Attitude, Values and Motivation

Concept, Nature, Process, Importance, Management Behavioural aspect of Perception. Effects of employee attitudes; Personal and Organizational Values; Job Satisfaction; Nature and Importance of Motivation; Achievement Motive; Theories of Work Motivation: Maslow's Need Hierarchy Theory McGregcrs's Theory 'X' and Theory 'Y'

UNIT-III

Personality

Definition of Personality, Determinants of Personality; Theories of Personality- Trait and Type Theories, The Big Five Traites, Mytes-Briggs Indicator; Locus of Control, SType A and Type B Assessment of Personality

UNIT-IV

Work Stress

Meaning and definition of Stress, Symptoms of Stress; Sources of Stress: Individual Level, Group Level, Organizational Level; Stressors, Extra Organizational Stressors; Effect of Stress – Burnouts; Stress Management – Individual Strategies, Organizational Strategies; Employee Counselling

UNIT-V

Group Behaviour and Leadership

Nature of Group, Types of Groups; Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of Effective Leaders

UNIT-VI

Conflict in Organizations

Nature of Conflict, Process of Conflict; Levels of Conflict – Intrapersonal, Interpersonal; Sources of Conflict; Effect of Conflict; Conflict Resolution, Meaning and types of Grievances & Process of Grievances Handling.

Course Code Course Name

BCA-204 Digital electronics and Computer Organisation

UNIT-I

Logic gates and circuit

Gates (OR, AND, NOR, NAND, XOR & XNOR); Demogran's laws; Boolean laws, Circuit designing techniques (SOP, POS, K-Map).

UNIT-II

Combinational Building Blocks

Multiplexes; Decoder; Encoder; Adder and Subtracter.

UNIT-III

Memories

ROMs, PROMs, EPROMs, RAMs, Hard Disk, Floppy Disk and CD-ROM.

UNIT-IV

Sequential Building Blocks

Flip-Flop (RS, D, JK, Master-slave & & T flip-flops); Registers & Shift registers; Counters; Synchronous and Asynchronous Designing method.

UNIT-V

Memory Organization: Basic cell of static and dynamic RAM; Building large memories using chips; Associative memory; Cache memory organization and Virtual memory organization

Course Code Course Name

BCA-205 Financial Accounting & Management

UNIT-I

Overview - Meaning and Nature of Financial Accounting, Scope of Financial Accounting, Financial Accounting & Management Accounting, Accounting concepts & convention, Accounting standards in India.

UNIT-II

Basics of accounting – Capital & Revenue items, Application of Computer in Accounting Double Entry System, Introduction to Journal, Ledger and Procedure for Recording and Posting, Introduction to Trail Balance, Preparation of Final Account, Profit & Loss Account and related concepts, Balance Sheet and related concept.

UNIT-III

Financial statement analysis: Ratio analysis, Funds flow analysis, concepts, uses, Preparation of funds flow statement, simple problem, Cash flow analysis, Concepts, uses, preparation of cash flow statement, simple problem, Break – even analysis.

UNIT-IV

Definition nature and Objective of Financial Management, Long Term Sources of Finance, Introductory idea about capitalization, Capital Structure, Concept of Cost of Capital, introduction, importance, explicit & implicit cost, Measurement of cost of capital, cost of debt.

UNIT-V

Concept & Components of working Capital. Factors Influencing the Composition of working Capital, Objectives of working Capital Management – Liquidity Vs. Profitability and working capital policies. Theory of working capital: Nature and concepts

UNIT-VI

Cash Management, Inventory Management and Receivables Management.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -III

Course Code	Course Name
BCA-301	Object Oriented Programming Using C++
BCA-302	Data Structure Using C & C++
BCA-303	Computer Architecture & Assembly Language
BCA-304	Business Economics
BCA-305	Elements of Statistics
BCA-306	Computer Laboratory and Practical Work of OOPS
BCA-307	Computer Laboratory and Practical Work of DS

Course Code Course Name

BCA-301 Object Oriented programming language

UNIT-I

Introduction

Introducing Object – Oriented Approach, Relating to other paradigms {Functional, Data decomposition}.

Basic terms and ideas

Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete, operators.

UNIT-II

Classes and Objects

Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State idendity and behaviour of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass / abstract classes.

UNIT-III

Inheritance and Polymorphism

Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parameteric Polymorphism

UNIT-IV

Generic function

Template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

UNIT-V

Files and Exception Handling

Streams and files, Namespaces, Exception handling, Generic Classes

Course Code Course Name

BCA-302 Data Structure Using C & C++

UNIT-I

Introduction to Data Structure and its Characteristics Array

Representation of single and multidimensional arrays; Sprase arrays – lower and upper triangular matrices and Tridiagonal matrices with Vector Representation also.

UNIT-II

Stacks and Queues

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

UNIT-III

Lists

Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion searching, Two way lists and Use of headers

UNIT-IV

Trees

Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree

UNIT-V

B-Trees

Introduction, The invention of B-Tree; Statement of the problem; Indexing with binary search trees; a better approach to tree indexes; B-Trees; working up from the bottom; Example for creating a B-Tree

UNIT-VI

Sorting Techniques; Insertion sort, selection sort, merge sort, heap sort, searching Techniques: linear search, binary search and hashing

Course Code Course Name

BCA-303 Computer Architecture & Assembly Language

UNIT-I

Basic computer organization and design, Instructions and instruction codes, Timing and control/ instruction cycle, Register/ Types of register/ general purpose & special purpose registers/ index registers, Register transfer and micro operations/ register transfer instructions, Memory and memory function, Bus/ Data transfer instructions, Arithmetic logic micro-operations/ shift micro-operations, Input/ Output and interrupts, Memory reference instructions, Memory interfacing memory/ Cache memory.

UNIT-II

Central Processing Unit

General Register Organization/ stacks organizations instruction formats, addressing modes, Data transfer and manipulation. Program control reduced computer, pipeline/ RISC/ CISC pipeline vector processing/ array processing.

Arithmetic Algorithms: Integer multiplication using shift and add, Booth's algorithm, Integer division, Floating-point representations.

UNIT-III

Computer Arithmetic

Addition, subtraction and multiplication algorithms, divisor algorithms. Floating point, arithmetic operations, decimal arithmetic operations, decimal arithmetic operations.

UNIT-IV

Input – Output Organization

Peripheral devices, Input/output interface, ALU Asynchronous Data transfer, mode of transfer, priority interrupts, Direct memory Address (DMA), Input/ Output processor (IOP), serial communication.

UNIT-V

Evaluation of Microprocessor

Overview of Intel 8085 to Intel Pentium processors Basic microprocessors, architecture and interface, internal architecture, external architecture memory and input/ output interface.

UNIT-VI

Assembly language, Assembler, Assembly level instructions, macro, use of macros in I/C instructions, program loops, programming arithmetic and logic subroutines, Input-Output programming.

Course Code Course Name

BCA-304 Business Economics

UNIT-I

The Scope and Method of Economics, the Economic Problem: Scarity & Choice, The Price Mechanism, Demand & Supply Equilibrium: The Concept of Elasticity and it's Applications.

The Production Process: output decisions – Revenues Costs and Profit Maximisation

Laws of returns & Returns to Scale: Economics and Diseconomies of scale.

UNIT-II

Market Structure: Equilibrium of a firm and Price, Output Determination under Perfect Competition Monopoly, Monoplastic Competition & Oligopoly

UNIT-III

Macro Economic Concerns

Inflalation, Unemployment, Trade-Cycles, Circular Flow upto Four Sector Economy, Government in the Macro Economy: Fiscal Policy, Monetary Policy, Measuring national Income and Output

UNIT-IV

The World Economy – WTO, Globalisation, MNC's, Outsourcing, Foreign Capital in India, Trips, Groups of Twenty (G-20), Issues of dumping, Export-Import Policy 2004-2009

Course Code Course Name

BCA-305 Elements of Statistics

UNIT-I

Population, Sample and Data Condensation

Definition and scope of statistics, concept of population and simple with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

UNIT-II

Measures of Central Tendency

Concept of central Tendency, requirements of a good measures of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data.

UNIT-III

Measures of Dispersion:

Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation.

UNIT-IV

Permutations and Combinations

Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions). ${}^{n}P_{r}$ = n!/(n-r) !(without proof). Combinations of 'r' objects taken from 'n' objects. ${}^{n}C_{r}$ = n!/(r!(n-r)!) (without proof) . Simple examples, Applications.

UNIT-V

Sample space, Events and Probability

Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples.

Classical definition of probability, Addition theorem of probability without Proof (upto three events are expected). Definition of conditional probability Definition of independence of two events, simple numerical problems.

UNIT-VI

Statistical Quality Control

Introduction, control limits, specification limits, tolerance limits, process and product control; Control charts for X and R; Control charts for number of defective {n-p chart} ,control charts for number of defects {c - chart}

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -IV

Course Code	**Course Name**
BCA-401	Computer Graphics & Multimedia Application
BCA-402	Operating System
BCA-403	Software Engineering
BCA-404	Optimization Techniques
BCA-405	Practical Based on Subject Code -401.
BCA-406	Mathematics-III

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-401 Computer Graphics & Multimedia Application

UNIT-I

Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Application Development of Hardware and software for computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

UNIT-II

Hardcopy Technologies, Display Technologies, Raster-Scan Display System, Video

Controller, Random-Scan Display processor, Input Devices for Operator Interaction, Image Scanners, Working exposure on graphics tools like Dream Weaver, 3D Effects etc,

Clipping

Southland- Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm

UNIT-III

Geometrical Transformation

2D Transformation, Homogeneous Coordinates and Matrix Representation of 2D Transformations, composition of 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.

UNIT-IV

Representing Curves & Surfaces

Polygon meshes parametric, Cubic Curves, Quadric Surface;

Solid Modeling

Representing Solids, Regularized Boolean Set Operation primitive Instancing Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry Comparison of Representations.

UNIT-V

Introductory Concepts: Multimedia Definition, CD-ROM and the multimedia highway, Computer Animation (Design, types of animation, using different functions) UNIT-VI

Uses of Multimedia, Introduction to making multimedia – The stage of Project, hardware & software requirements to make good multimedia skills and Training opportunities in Multimedia Motivation for Multimedia usage

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-402 **Operating System**

UNIT-I

Introduction, What is an operating system, Simple Batch Systems, Multi-programmed Batch systems, Time- Sharing Systems, Personal – Computer Systems, Parallel systems, Distributed

systems, Real- Time Systems**.**

Memory Management: Background, Logical versus physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page- replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations

UNIT-II

Processes: Process Concept, Process Scheduling, Operation on Processes

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple – Processor Scheduling.

Process Synchronization: Background, The Critical – Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

UNIT-III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT-IV

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap- Space Management, Disk Reliability

UNIT-V

Information Management: Introduction, A Simple File system, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File system File – System Interface; File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File – System Implementation: File – System Structure, Allocation Methods, Free- Space Management

Course Code Course Name

BCA-403 Software Engineering

UNIT-I

Software Engineering: Definition and paradigms, A generic view of software engineering.

UNIT-II

Requirements Analysis: Statement of system scope, isolation of top level processes and entitles and their allocation to physical elements, refinement and review.

Analyzing a problem, creating a software specification document, review for correctness, consistency, and completeness.

UNIT-III

Designing Software Solutions: Refining the software Specification; Application of fundamental design concept for data, architectural and procedural designs using software blue print methodology and object oriented design paradigm; Creating design document: Review of conformance to software requirements and quality.

UNIT-IV

Software Implementation: Relationship between design and implementation, Implementation issues and programming support environment, Coding the procedural design, Good coding style and review of correctness and readability.

UNIT-V

Software Maintenance: Maintenance as part of software evaluation, reasons for maintenance, types of maintenance (Perceptive, adoptive, corrective), designing for maintainability, techniques for maintenance.

UNIT-VI

Comprehensive examples using available software platforms/case tools, Configuration Management.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-404 **Optimization Techniques**

UNIT-I

Linear programming

Central Problem of linear Programming various definitions included Statements of basic theorem and also their properties, simplex methods, primal and dual simplex method, transport problem, tic-tac problem, and its solution. Assignment problem and its solution. Graphical Method Formulation, Linear Programming Problem.

UNIT-II

Queuing Theory

Characteristics of queuing system, Classification of Queuing Model Single Channel Queuing Theory, Generalization of steady state M/M/1 queuing models(Model-I, Model-II).

UNIT-III

Replacement Theory

Replacement of item that deteriorates replacement of items that fail. Group replacement and individual replacement.

UNIT-IV

Inventory Theory

Cost involved in inventory problem- single item deterministic model economics long size model without shortage and with shorter having production rate infinite and finite.

UNIT-V

Job Sequencing

Introduction, solution of sequencing problem Johnson s algorithm for n jobs through 2 machines

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-405 Mathematics –III

UNIT-I

COMPLEX VARIABLES: Complex Number System, Algebra of Complex Numbers, Polar Form, Powers and Roots, Functions of Complex Variables, Elementary Functions, Inverse Trigonometric Function.

UNIT-II

SEQUENCE, SERIES AND CONVERGENCE: Sequence, Finite and Infinite Sequences, Monotonic Sequence, Bounded Sequence, Limit of a Sequence, Convergence of a Sequence, Series, Partial Sums, Convergent Series, Theorems on Convergence of Series (statement, alternating series, conditional convergent), Leibnitz Test, Limit Comparison Test, Ratio Test, Cauchy's Root Test, Convergence of Binomial and Logarithmic Series, Raabe's Test, Logarithmic Test, Cauchy's Integral Test (without proof)

UNIT-III

VECTOR CALCULUS: Differentiation of Vectors, Scalar and Vector Fields, Gradient, Directional Derivatives, Divergence and Curl and their Physical Meaning.

UNIT-IV

FOURIER SERIES: Periodic Functions, Fourier series, Fourier Series of Even and Odd Functions, Half Range Series.

UNIT-V

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Variable - Separable Method, Homogeneous Differential Equations, Exact Differential Equations, Linear Differential Equations, Bernoulli's Differential Equations, Differential Equations of First Order and First Degree by Integrating Factor.

UNIT-VI

ORDINARY DIFFERENTIAL EQUATIONS OF SECOND ORDER: Homogenous Differential Equations with Constant Coefficients, Cases of Complex Roots and Repeated

Roots, Differential Operator, Solutions by Methods of Direct Formulae for Particular Integrals, Solution by Undetermined Coefficients, Cauchy Differential Equations, (only Real and Distinct Roots) Operator Method for Finding Particular Integrals, (Direct Formulae).

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -V

Course Code	**Course Name**
BCA-501	Introduction to DBMS
BCA-502	Java Programming and Dynamic Webpage Design
BCA-503	Computer Network
BCA-504	Numerical Methods
BCA-508	Minor Project
BCA-507	Viva-Voice on Summer Training
BCA-505	Computer Laboratory and Practical Work of DBMS
BCA-506	Computer Laboratory and Practical Work of Java Programming & Dynamic Webpage Design

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-501 **Introduction to DBMS**

UNIT-I

Introduction: Characteristics of database approach, data models, DBMS architecture and data independence.

UNIT-II

E-R Modeling: Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization.

UNIT-III

File Organization: Indexed sequential access files; implementation using B & B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance.

UNIT-IV

Relational Data Model: Relational model concepts, relational constraints, relational alzebra

SQL: SQL queries, programming using SQL.

UNIT-V

EER and ER to relational mapping: Data base design using EER to relational language.

UNIT-VI

Data Normalization: Functional Dependencies, Normal form up to 3rd normal form.

Concurrency Control: Transaction processing, locking techniques and associated, database recovery, security and authorization. Recovery Techniques, Database Security

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA- 502 **Java Programming and Dynamic Webpage Design**

UNIT-I

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, package, exception handling) multithreaded programming.

UNIT-II

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions)

UNIT-III

Networking (datagram socket and TCP/IP based server socket) event handling, JDBC:

Introduction, Drivers, Establishing Connection, Connection Pooling.

UNIT-IV

HTML: use of commenting, headers, text styling, images, formatting text with <FONT>, special characters, horizontal rules, line breaks, table, forms, image maps, <META> tags, <FRAMESET> tags, file formats including image formats.

UNIT-V

Java Servlets: Introduction, HTTP Servlet Basics, The Servlet Lifecycle, Retrieving Information, Sending HTML Information, Session Tracking, Database Connectivity

UNIT-VI

Java Server Pages: Introducing Java Server Pages, JSP Overview, Setting Up the JSP Environment, Generating Dynamic Content, Using Custom Tag Libraries and the JSP Standard Tag Library, Processing Input and Output

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-503 **Computer Network**

UNIT-I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks. **OSI and TCP/IP Models:** Layers and their functions, comparison of models.

Digital Transmission: Interfaces and Modems: DTE-DCE Interface, Modems, Cable modems.

UNIT-II

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media

UNIT-III

Telephony: Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching.

Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.

Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP. **ISDN:** Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN. **UNIT-IV**

Devices: Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internetworking, Network-Layer in the internet.

UNIT-V

Transport and upper layers in OSI Model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-504 **Numerical Methods**

UNIT-I

Roots of Equations: Bisections Method, False Position Method, Newton's Raphson Method, Rate of convergence of Newton's method.

UNIT-II

Interpolation and Extrapolation : Finite Differences, The operator E, Newton's Forward and Backward Differences, Newton's dividend differences formulae, Lagrange's Interpolation formula for unequal Intervals, Gauss's Interpolation formula, Starling formula, Bessel's formula, Laplace-Everett formula.

UNIT-III

Numerical Differentiation Numerical Integration : Introduction, direct methods, maxima and minima of a tabulated function, General Quadratic formula, Trapezoidal rule, Simpson's One third rule, Simpson's three- eight rule.

UNIT-IV

Solution of Linear Equation: Gauss's Elimination method and Gauss's Siedel iterative method.

UNIT-V

Solution of Differential Equations: Euler's method, Picard's method, Fourth-order Ranga – Kutta method.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise
SEMESTER -VI

Course Code	Course Name
BCA-601	Computer Network Security
BCA-602	Information System: Analysis Design & Implementation
BCA-603	E-Commerce
BCA-604	Knowledge Management
BCA-605	Major Project
BCA-606	Presentation/Seminar based on Major Project

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-601 Computer Network Security

UNIT-I

Introduction: Attack, Services and Mechanism, Model for Internetwork Security.

Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

UNIT-II

Network Security:

Authentication Application: Kerveros, X.509, Directory Authentication Service, Pretty Good Privacy, S/Mime.

UNIT-III

IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load combining Security Associations, Key Management.

UNIT-IV

Web Security: Requirement, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

UNIT-V

Network Management Security: Overview of SNMP Architecutre-SMMPVI1 Communication Facility, SNMPV3.

UNIT-VI

System Security: Intruders, Viruses and Relate Threats, Firewall Design Principles. Comprehensive examples using available software platforms/case tools, Configuration Management.

Course Code Course Name

BCA-602 Information System Analysis Design and Implementation

UNIT-I

Overview of System Analysis and Design: Systems Development Life Cycle; concept and Models: requirements determination, logical design, physical design, test planning, implementation, planning and performance evaluation, communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group based approaches, JAD, structures walkthroughs, and design and code reviews; prototyping; database design software quality metrics; application categories software package evaluation and acquisition.

UNIT-II

Information Requirement Analysis: Process modeling with physical logical data flow diagrams, data modeling with logical entity relationship diagrams.

UNIT-III

Developing a Proposal: Feasibility study and cost estimation.

System Design: Design of input and control, design of output and control, file design/database design, process, user interface design, prototyping; software constructors; documentation.

UNIT-IV

Application Development Methodologies and CASE tools: Information engineering structured system analysis and design, and object oriented methodologies for application development data modeling, process modeling, user interface design, and prototyping, use of computer aided software engineering (CASE) tools in the analysis design and implementation of information systems.

UNIT-V

Design and Implementation on OO Platform: Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional object oriented design and object oriented programming systems for implementation, object oriented data bases.

UNIT-VI

Managerial issues in Software Projects: Introduction to software markets; planning of software projects, size and cost estimates; project scheduling; measurement of software quality and productivity, ISO and capability maturity models for organizational growth.

Course Code Course Name

BCA-603 E-Commerce

UNIT-I

Introduction to E-Commerce: The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage Sustainable Competitive Advantage, Competitive Advantage using E -Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

UNIT-II

Business-to-Business Electronic Commerce: Characteristics of B2B EC, Models of B2B Ec,

Procurement Management Using the Buyer's Internal Marketplace, Just in Time Delivery, Other

B2B Models, Auctions and Services from Traditional to Internet Based EDI, Intergration with

Back-end Information System, The Role of Software Agents for B2B EC, Electronic marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

UNIT-III

Internet and Extranet : Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet and Extranet, Intranet software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The structures of Extranets, Extranet products & services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

Electronic Payment Systems : Is SET a failure, Electronic Payments & Protocols, Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet, Electronic Fund transfer and Debit cards on the Internet, Stored – value Cards and E- Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

UNIT-IV

Public Policy: From Legal Issues to Privacy : EC- Related Legal Incidents, Legal Incidents, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection In EC.

UNIT-V

Infrastructure For EC : It takes more than Technology, A Network Of Networks, Internet Protocols, Web- Based client/ Server, Internet Security, selling on the web, Chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial Issues.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-604 Knowledge Management.

UNIT-I

Business Intelligence and Business Decisions: Modeling Decision Process; Decision support systems; Group decision support and Groupware Technologies.

UNIT-II

Executive Information and support Systems: Business Expert System and AI, OLTO & OLAP; Data Warehousing; Data Marts, Data Warehouse architecture; Tools for data warehousing.

UNIT-III

Multi- Dimensional analysis: Data mining and knowledge discovery; Data mining and Techniques; Data mining of Advance Databases.

UNIT-IV

Knowledge Management Systems: Concept and Structure KM systems, techniques of knowledge management appreciation & limitation.

CH. CHARAN SINGH UNIVERSITY, MEERUT
BACHELOR OF COMMERCE

SYLLABUS
(Effective from Academic Year 2018-19 onwards)

CH. CHARAN SINGH UNIVERSITY, MEERUT

CH. CHARAN SINGH UNIVERSITY, MEERUT
B.COM SYLLABUS (2018-19 and onwards)

Year : I

CODE NO.	TITLE OF PAPER / COURSE	EXTERNAL MARKS
C-101	BUSINESS COMMUNICATION	100
C-102	BUSINESS STATISTICS	100
C-103	FINANCIAL ACCOUNTING	100
C-104	BUSINESS REGULATORY FRAMEWORK	100
C-105	BUSINESS ECONOMICS	100
C-106	BUSINESS ENVIRONMENT	100
	Total	600

Year: II

CODE NO.	TITLE OF PAPER/COURSE	EXTERNAL MARKS
C- 201	COMPANY LAW	100
C- 202	COST ACCOUNTING	100
C- 203	PRINCIPLES OF BUSINESS MANAGEMENT	100
C-204	INCOME TAX	100
C-205	FUNDAMENTALS OF ENTREPRENEURSHIP	100
C-206	PUBLIC FINANCE	100
	TOTAL	

Year: III

CODE NO.	TITLE OF PAPER/COURSE	EXTERNAL MARKS
C- 301	CORPORATE ACCOUNTING	100
C- 302	AUDITING	100
C- 303	PRINCIPLES OF MARKETING	100
C-304	ECONOMIC LAWS	100
C-305	E-COMMERCE	100
C-306	MANAGEMENT ACCOUNTING	100

B.COM. I YEAR
PAPER – I
BUSINESS COMMUNICATION (C-101)

Objective

The objective of this course is to develop effective business communication skills among the students.

Course Inputs:

Unit I: Introducing business communication: Basic forms of communicating; Communication models and process; Effective communication; Theories of communication; Audience analysis; Principles of effective communication

Unit III: Self – Development and Communication: Development of positive personal attitudes; SWOT analysis; Vot's model of interdependence; Whole communication.
Corporate communication: Formal and in informal communication networks; Grapevine; Miscommunication(Barriers),Improving communication. Practices in business communication; Group discussions; Mock interviews; Seminars; Effective listening exercises; Individual and group presentations and Reports writing.

Unit III: Writing skills : Planning business messages; Rewriting and editing; The first draft; Reconstructing the final draft; Business letters and memo formats; Appearance; Persuasive letters; sales letters; collection letters; office memorandum.
Report writing: Introduction to a proposal, short report and formal report, Report preparation. Oral presentation; Principles of oral presentation, Factors affecting presentation, Sales presentation, Training presentation, Conducting surveys, speeches to motivate, Effective presentation skills

Unit IV: Non –verbal aspects of communicating: Body language; kinesics proxemics, Para language. Effective listening; Principles of effective listening; Factors affecting listening exercise; oral written and video session
Interviewing skills: Appearing in interviews; Conducting interviews; Writing resume and letter of application.

Unit V: Modern Forms of Communicating: Fax; E-mail; Video conferencing; etc. International Communication: Cultural sensitiveness and cultural context; Writing and presenting in international situations; Inter-cultural factors in interactions; Adapting to global business.

PAPER – II
BUSINESS STATISTICS (C-102)

Objective

The purpose of the paper is to inculcate and analytical ability among the students

Unit I: Introduction: Meaning, Scope, Importance and limitation of statistics. Statistical investigation: Planning of statistical investigation, Census data, Statistical errors and approximation, Classification and tabulation of data frequency distribution.

Unit II: Statistical Average: Arithmetic, Geometric and harmonic means, Mode median, Qualities and percentiles, Simple and weighted averages. Uses and limitation of different averages.

Unit III: Dispersion and skewness : Range quartile deviation mean, Deviation and their coefficients, Standards deviation coefficient of variation skewness and its coefficiants.

Unit IV: Correlation : Karl parson's coefficient of correlation, Probable error and interpretation of coefficient of correlation rank difference method and concurrent deviation method

Unit V: Analysis of time series: component of time series, Calculation of secular trend– moving average method and method of least squares. Index numbers: Utility of index numbers problems in the construction of index numbers simple and weighted index numbers, base shifting fishers ideal index numbers and tests of reversibility

PAPER – III
FINANCIAL ACCOUNTING (C-103)

Objective

To import basic accounting knowledge as applicable to business

Course Inputs:

Unit I: Introduction to Accounting standards and IFRS, Human Resource Accounting, Inflation Accounting and Responsibility Accounting Theoretical concept only.

Unit II: Insolvency Accounts: Individual & Partnership firm (as per IBC_2016)

Unit III: Branch Accounts: Dependent Branch; Debtors system, Stock and debtors system; Final accounts system;Wholesale branch; Independent branch; Foreign branch; Departmental Accounts.

Unit IV: Hire – purchase and installment purchase system; Meaning of hire – purchase contract; legal provision regarding hire – purchase contract; Accounting records for goods of substantial sale values, and Accounting records for goods of small values ; Installment purchase system; After sales services.

Unit V: Royalties Accounts : Insurance claims

PAPER – IV
BUSINESS REGULATORY FRAMEWORK (C-104)

Objective

The objective of this course is to provide a brief idea about the frame work of Indian business laws.

Unit I: The Indian Contract Act, 1872 : Nature of contract classification; Offer and acceptance; Capacity of parties to contract; Free consent; Consideration legality of object; agreement declared vaid; Performance of contract; Discharge of contract; Remedies for breach of contract.

Unit II: Special contract: Indemnity; Guarantee; Bailment and pledge; Agency.

Unit III: Sale of goods act 1930 : Formation of contracts of sale ; Goods and their classification, Price; Condition, And warranties; Transfer of property in goods; Performance of the contract of sale; Unpaid seller and his rights, Sale by auction; Hire purchase agreement.

Unit IV: The consumer protection Act 1986 : Silent feature definition of consumer; Grievance redressal machinery.

Unit V: Limited liability partnership Act – 2008

PAPER – V
BUSINESS ECONOMICS (C-105)

Objective

This course in meant to acquaint the student with the principles of business economics as are applicable in business

Unit I: Introduction : Basic problems of an economy working of price mechanism.

Unit II: Elasticity of demand : Concept and measurement of elasticity of demand; Price, Income and cross Elasticities; Average revenue, Marginal revenue, And elasticity of Demand; Determinants of elasticity of demand; Importance of elasticity of demand

Unit III: Production function: Law of variable properties iso–quants; Economic regions and optimum factor combination; Expansion path; Return to scale; Internal and external economics and diseconomies; Ridge lines.
Theory of Costs: Short-run and long-run cost curves- Traditional and modern approaches.

Unit IV Market structure : Market structure and business decisions; Objectives of a business firm a perfect competition; Profit maximization and equilibrium of firm and indust short rum and long rum supply curves; Price and output determination practical applications. Monopoly; Determination of price under monopoly; Equilibrium of a firm; Comparison between perfect competition and monopoly; Multi-plant monopoly; Price discrimination. Practical application.

Unit V: a. Monopolistic competition: Meaning and characteristic; Price and output Determination under monopolistic competition; Product differentiation; selling costs; Comparison with perfect competition; Excess capacity under monopolistic competition.

b. Oligopoly: Characteristics indeterminate pricing and output; Classical models of oligopoly; Price leadership; Collusive oligopoly; Kinked demand curve.

PAPER – VI
BUSINESS ENVIRONMENT (C-106)

Objective

This course aims acquainting the students with the emargiong issue in business at the national and international level in the light of the policies of liberalization and globalization.

Unit I: Indian business environment: Concept, Components, and Importance

Unit II : Economic trend (overviews) : Income; Savings and investment; Industry; Trade and balance of payments, Money; Finance, Prices.

Unit III : Problems of growth : Unemployment; Poverty; Regional imbalances; Social injustics; Inflation paralled economy; Industrial sickness

Unit IV: Role of Government : Monetary and fiscal policy; Industrial policy; Industrial licensing Privatization; Devolution export – import policy; Regulation of foreign investment.

Unit V: Niti Aayog : Philosophy, Function and role of niti aayog.

B.COM. II
PAPER – I
COMPANY LAW (C-201)

PROVISIONS OF THE COMPANIES ACT, 2013 AND AMENDMENTS UP TO DATE RELATING to

Unit -1: Introduction to Companies Act, 2013; Important Definitions; Incorporation of a company and matters incidental thereto
(Relevant section 1 to 22)

Unit -2: Prospectus and Allotment of Securities- Public Offer & Private Placement; Share Capital & Debentures; Acceptance of Deposits by Companies; Registration of charges.
(Relevant section 23 to 87)

Unit -3: Management & Administration – Register of Members, Annual Returns, Annual General Meeting, Extra –ordinary General Meeting; Declarations and Payment of Dividend ; Accounts and Audit of Companies.
(Relevant section 88 to 148)

Unit - 4: Directors –Appointment & Qualification; Meeting of Board and its powers; Prevention of oppression & Mismanagement.
(Relevant section 149 to 195) & **(Relevant section 241to 246)**

Unit - 5: Winding up – Modes of winding up, Winding up by Tribunal, Voluntary winding up, Official Liquidator
(Relevant section 270 to 365)

PAPER – II
COST ACCOUNTING (C-202)

Objective

This course exposes the students to the basic concepts and the tools used in cost accounting.

Course Inputs:

Unit I: Introduction: Nature and scope of cost accounting; Cost concepts and classification; Methods and techniques; Installation of costing system; Concept of cost audit.

Unit II: Basics of Material, Labour and Overhead cost:

a. Concept of Material, Pricing of material issues; Treatment of material losses.
b. Labour turnover ;Idle time and overtime; Methods of wage payment-time and piece rates;
c. Classification and departmentalization of overhead, Absorption of overheads; Determination of overhead rates; Machine hour rate.

Unit III: Cost Ascertainment: Unit costing; Operating costing.

Unit IV: Job, Batch and Contract costing; Process costing including inter-process profit; Joint and By product.

Unit V: Cost Records: Integral and non-integral system; Reconciliation of cost and financial accounts.

PAPER – III
PRINCIPLES OF BUSINESS MANAGEMENT (C-203)

Objective

This course familiarizes the student with the basics of principles of management.

Course Inputs:

Unit I: Introduction : Concept, nature process and significance of management ; Managerial roles (Mintzberg); An overview of functional areas of management. Development of management thought ; Classical and nco-classical system : Contingency approaches.

Unit II: Planning : Concept, process , Types. Decision making- concept and process; Bounded rationality ; Management by objective ; Corporate planning ; Environment analysis and diagnosis ; Strategy formulation.

Unit III: Organizing : Concept, nature, process, and significance; Authority and responsibility relationship.

Unit IV: Motivating and Leading People at work : Motivation – concept; Theories-Maslow, Herzberg, McGregor, and Quchi; Financial and non-financial incentives. Leadership – concept and leadership styles; Leadership theories (Trannenbaum and Schmidt.); Likert's System Management; Communication-nature process, Network and barriers; Effective communication.

Unit V: Managerial Control: Concept and process; Effective control system; Techniques of control –traditional and modern.

PAPER – IV
INCOME TAX (C-204)

Objective

It enables the students to know the basics of Income Tax and its implications.

Course Inputs:

Unit I: Basis Concept: Income, Agricultural income, Casual income, Assessment year, Previous year, Gross total income, person; Tax evasion, Avoidance and tax planning.

Unit II: Basis of Charge: Scope of total income, Residence and tax liability, Income which does not form part of total income.

Unit III: Heads of Income: Salaries; Income from house property; Profit and gains of business or profession, Including provision relating to specific business; Capital gains; Income from other sources.

Unit IV: Computation of Tax Liability: Computation of total income and tax liability of an individual Aggregation of income; Set-off and carry forward of losses; Deduction from gross total income.

Unit V: Tax Management: Tax deduction at source; Advance payment of tax; Assessment procedures; IT Authorities.

PAPER – V
FUNDAMENTALS OF ENTREPRENEURSHIP (C-205)

Objective

It provides exposure to the students to the entrepreneurial culture and industrial growth so as to preparing them to set up and manage their own small units.

Course Inputs:

Unit I : Introduction : The entrepreneur ; Definition ; Emergence of entrepreneurial class; Theories of entrepreneurship ; Role of socio-economic environment ; Characteristics of entrepreneur ; Leadership; Risk taking ; Decision-making and business planning.

Unit II: Promotion of a Venture: Opportunities analysis; External environmental analysis-economic, social, and technological; Competitive factors; Legal requirements for establishment of a new unit, And raising of funds; Venture capital sources and documentation required.

Unit III: Entrepreneurial Behaviour: Innovation and entrepreneur; Entrepreneurial behavior and Psycho-Theories , Social responsibility.

Unit IV: Entrepreneurial Development Programmes (EDP): EDP, Their role, Relevance, And achievements; Role of Government in organizing EDPs; Critical evaluation.

Unit V: Role of Entrepreneur: Role of an entrepreneur in economic growth as an innovator, Generation of employment opportunities, Complimenting and supplementing economic growth, Brining stability and balanced regional development of industries; Role in export promotion and import substitution, Forex earning, and augmenting and meeting local demand.

PAPER – VI
PUBLIC FINANCE (C-206)

Objective

The objective of this course is to provides basic knowledge about various intricacies for Public finance

Course Inputs:

Unit I: Meaning & Scope of Public Finance Public Finance Vs Private Finance, Principle of Maximum Social Advantage, Public Budget, Techniques of Budgeting (ZBB PBB), Deficit Financing.

Unit II: Public Expenditure: Meaning & Nature Wanger's views on increasing state activities Wiseman-peacock hypothesis, Cannons and classification of public expenditure effects on production, Distribution and economic stability.

Unit III: Public Revenue: Main sources of revenue, Tax revenue, Direct and Indirect Taxes, Progressive, Proportional & Regressive Taxes, Value added tax, The Division of tax burden, Incidence of a tax, Effect on production & distribution

Unit IV: Public Debts: Role and classification of Public debts and methods of their redemption.

Unit V: Indian Public Finance: Financial Federalism under constitution, Financial Adjustment in India, Finance Commission, Review of Indian Tax System Budgetary Procedure and Financial Control in India.

B.COM. III
(PAPER – I)
CORPORATE ACCOUNTING (C-301)

Objective

This course enable the students to develop awareness about corporate accounting in conformity with the provisions of companies Act.

Course Input

Unit I: Issue of Shares and Debentures: Issue, Forfeiture and re-issue of shares, Redemption of preference shares; Issue and redemption of debentures

Unit II : Accounting for special issue : Bonus issue, Employee's stock option plan, Buy back of shares.

Unit III : Valuation of goodwill and shares, Underwriting of shares .

Unit IV: Final accounts :As per latest format Prescribed under companies Act, 2013.

Unit V: Consolidated balance sheet of holding companies with one subsidiary only.

PAPER – II
AUDITING (C-302)

Objective

This course aims at imparting knowledge about the principal and methods or auditing and their applications .

Course Inputs

Unit I : Introduction: Meaning and objective of auditing; Types of audit; Audit programme; Audit notebooks; Working papers and evidences; Consideration for commencing an audit; Routine checking and test checking; Internal check system; Internal audit and Internal control.

Unit II: Audit Procedure: Vouching; Verification of assets and liabilities.

Unit III: Audit of companies: Company auditor appointment, Powers, Duties and Liabilities. Removal of auditor as per provision of the companies Act 2013

Unit IV: Auditor's report-clean report and qualified report.

Unit V: Recent trends in auditing: Nature and significance of cost audit; Tax audit, management audit.

PAPER – III
PRINCIPLES OF MARKETING (C-303)

Objective The objective of this course is to help students understand the concept of marketing and its applications.

Course Inputs

Unit I. Introduction: Nature and scope of marketing; Importance of marketing as a business function and in the economy; Marketing concept: Traditional and modern; Selling vs. marketing; Marketing mix; Marketing environment.

Unit II. Consumer Behavior and market Segmentation: Nature, Scope, And significance of consumer behavior; Market segmentation- concept and importance; Bases for market segmentation.

Unit III. Product: Concept of product, Consumer and industrial goods, Product planning and development; Packaging. Role and Functions; Brand name and trade market; After sales service; Product life cycle concept.
Price : Importance of price in the marketing mix; Factors affecting Price of a product/service; Discounts and rebates.

Unit IV. Distributions channels and physical Distribution: Distribution channels- Concept and role; Types of distribution channels; Factors affecting choice of a distribution channel; Retailer and wholesaler. Promotion Methods of promotion; Optimum Promotion mix; Advertising media-their relative merits and limitation; Characteristics of an affective advertisement; Personal Selling as a career.

Unit V. International Marketing: Nature, Definition and scope of international marketing; Domestic marketing vs. international marketing; International marketing environment –external and inernal.

Identifying and selecting foreign market: Foreign market entry mode decisions.

PAPER – IV
ECONOMIC LAWS (C-304)

Objective It will provide a basic knowledge of Economic laws to the learners.

Unit I: Securities Laws: SEBI Act, 1992; Depositories Act. 1996.

Unit II: Environmental Laws: The Environment Protection Act, 1986; water (Prevention &. control of pollution) Act, 1974, Air (Prevention control of Pollution) Act, 1981; NGT Act, 2010

Unit III. IPR Laws: Trade Market Act, 1999; Patents 1970 The designs Act 2000; Indications of Goods (Registration & Protection) Act, 1999; copy right Act, 1957

Unit IV: Foreign exchange & Anti-corruption Laws: FEMA 1999; Prevention of Money Laundering Act, 2002.

Unit V: Industrial Laws: Factoreis Act 1948 ; Industrial Disputes Act, 1947.

PAPER – V
E-COMMERCE (C-305)

Objective : To enable the student to become competent to under stand the mechanism for excelling in E Commerce based employment and self-employment oppotunties.

Unit I. Introduction : Introduction to E commerce and Definition, E-commerce based activities, Goals of E-commerce, Technical components of E-commece, Functions, Advantages and disadvantages of E-commerce Scape of E-commerce, Electronic commerce Application Frame work of E-commerce, Supply chain Management Electronic commerce and Electronic Business.

Unit II: Planning on-line Business: Nature and dynamics of the internet. Electronic business models: B2B, B2C, C2C, C2B, website Design : Websites as market place E-commerce, Pure online vs. brick and click business; Assessing requirement for an online business desiging developing and deplaying the system.

Unit III: Technology for online-Business: Internet and its Evolution, It Infrastructure, Middleware Domain names, Contents : Text and integrating E-business applications. component of internet information technology structure, Development of internet, Extranet and their Differnence.

Unit IV: Operations of E-commerce: online-payment mechanism; Electronic Payment system; Payment Gateways; Visitors to website ; Tools for promoting websites; Risk management option for e-Payment Systems.

Unit V: Security and legal Aspects of E-commerce: Threats in E-commerce, Security of clients and Service-Provider, Cyber Laws-Relevant Provisions of information Technology Act 2000, offences, Secure electronic records and digital signatures Penalties and adjudication.

PAPER – VI
MANAGEMENT ACCOUNTING (C-306)

Objective : To enable the students to understand the practical knowledge of decision making accounting Which is related to the management.

Unit I: In**troduction:** Meaning, Nature, Scope and Function of management Accounting; Role of Accounting ;Management Accounting Vs. Financial Accounting ;Tools and Techniques of management Accounting.

Unit II: Budgetory Control ; Meaning of Budget, Budgeting and budgetory control; Objectives ,Merits and limitations of budgetary control; Types of budget: Fixed and flexible budget; Zerobard Budget ;Performance budgeting.

Unit III : Funds flow and cash flow analysis ; Ratio analysis funds flow analysis and cash flow analysis as per accounting standards; Ratio analysis classification and limitations.

Unit IV: Standard costing and analysis of variances: Meaning and nature of standard cost; Advantages and applications ; Steps in standard costing ;Variance analysis-material, Labour, Overhead and sales variances

Unit V : Marginal Costing: Concept meaning and nature of marginal cost; Marginal cost as a tool of decisions making ; Marginal costing Vs absorption costing; Break-even analysis; Exploring new markets; Make or buy decisions and shut down decisions.

Chaudhary Charan Singh University
Merrut

Syllabus Of B.Sc Agriculture

B.Sc. Ag., SEMESTER-I

Sl. No.	Department	Credit Hours	Title of the course
1.	English Department	1+1=2	Structural & Spoken English
2	Agronomy	2+1=3	Principles of crop Prodcution Principles of Agronomy (ICAR)
3	Ag. Chemistry	2+1=3	Fundamentals of Soil Science
4	Ag. Botany	1+1=2	Elements of Genetics
5	Statistics	1+1=2	Elementary Statics and applied mathematics elements of Statistics (ICAR)
6	Soil Conservation	1+1=2	Agricultural Meterology
7	Agriculture Extension	1+1=2	Rural Sociology and Educational Psychology
8	Horticulture	2+1=3	Fundamentals of Horticulture
9.	Physical Department	0+1=1	Physical Education (Only Practical No. Syllabus by ICAR)

Course- I

Semester- I **1+1=2**

STRUCTURAL & SPOKEN ENGLISH

(A) ELEMENTS OF ENGLISH GRAMMER : A REVISION

1. Study and use of Articles: Pronouns and Prepositions.
2. Tenses in English

(B) SENTENCE STRUCTURE

1. Sentence formation
2. Some common varieties of sentence structure (including errors).

(C) READING COMPREHENSION

Six specified lessons from the following text book:

Name : Glimpses of English Prose.

Author : Dr. O.P. Dixit

Publisher : Sahitya Niketan, Kanpur

(D) WRITTEN COMMUNICATION

1. Letter and application writing
2. Report writing.

(E) VOCABULARY

1. Synonyms and antonyms
2. One word substitution
3. Affixes, prefixes and suffixes

PRACTICALS

1. Speech mechanism-speech event, production of speech, speech organs.
2. Phonetic sounds and symbols-pure vowels, diphthongs and constants (voiceless/voiced, accented/u naccented, aspirated/u naspirated).
3. Stress and intonation-word-accent (syllable, consonant clusters), stressshift, compound words, word accent in Indian English v/s R.P., rules for accentual patterns.
4. Accent in connected speech-rhythm, weak forms, intonation etc.
5. Listening comprehension
6. Reading comprehension.

Course- II

Semester-I **2+1=3**

PRINCIPLES OF CROP PRODUCTION

PRINCIPLES OF AGRONOMY (ICAR)

1. Definition and scope of Agronomy.
2. Classification of Crops of Different basis.
3. General principles of Crop production : Climate, soil, preparation, seed and sowing, post sowing-tillage, water management, nutrition, plant protection measures, harvesting, threshing and storage.
4. Crop sequences and system with emphasis on mixed cropping and inter cropping.
5. Nutritional management of crops including application of meanures, fertilisers and bio-fertilisers. Concept of integrated nutrient supply system.

Practical

1. Study of weather and weather forecasting.
2. Identification of crops, manures and fertilisers.
3. Framing of crop rotations and preparation of cropping schemes for varying agro-climatic conditions.
4. Preparation of seed bed based on important inter-cropping systems.
5. Calculation of fertiliser requirement, fertiliser mixtures and unit values.
6. Methods of fertiliser application.

Course- III

semester- I **2+1=3**

FUNDAMENTALS OF SOIL SCIENCE

1. Definition of Soil, Components of Soil and their role in agriculture.
2. Soil forming rocks and minerals, Development, of Soil profile, Soil formation, factors affecting soil formation, soil forming processes.
3. Soil reaction and its measurements and significance.
4. Chemistry of clay minerals with special reference to Kaoinite, Montmorrillonite and little.
5. Physical properties of soil, and their significance.
6. Chemical properties of soil, cation and anion exchange phenomenon and their importance in agriculture.
7. Soil organic matter, humus formation and its importance in soil fertility, management and maintenance of organic matter in soils.
8. Soil of U.P. classification, distribution, characteristics.
9. Elementary idea of soils of India-occurrence, characteristics, physicochemical properties of chernozems, pobzol and laterite soil.
10. Basic idea of comprehensive system (7th approximation) of soil classification.
11. Elementary idea of soil survey and Land capability classification.
12. Occurrence, distribution and functions of Soil Micro-organism. Biological Nitrogen Fixation (Symbiotic and Non symbiotics), Nitrification, Microbial decomposition of orgame Matter in soil,
13. Role and use of Biofertilizers.in Crop Production,
14. Role and use of Biofertilizers in Crop Production,
15. Classification and use of Insecticide, Fungicides and herbicides eg. BNC, DDT, Malthion, 2,4,D.

Practical:

1. Preparation of HCL extract of Soil
2. Determination of FeO, R203, Ca and P in HCL extract

3. Determination of soil O.M.
4. Estimation of Cl, C03, HCO3 in soil extract
5. Determination of total nitrogen in soil.

Course- IV

Semester- I **1+1=2**

ELEMENTS OF GENETICS

1. Definition, significance and historical development in genetics.
2. Mendel's Law's of heredity.
3. Chromosomal theory of inheritance, melosis and mitosis.
4. Linkage and crossing over-types, mechanism and significance,
5. Nucleic acid as genetic material-structure, replication, genetic code and translation.
6. Mutation-spontaneous and induced.
7. Chromosomal changes-molecular structure and numerical.
8. Multiple factor inheritance and multiple alleles, blood groups in man and body coat colour in rabits.
9. Sex chromosomes and its determination in man and droisophila, sex linked characters.
10. Cytoplasmic inheritance-plasma and nuclear, gene inter-action.

Practical

1. Preparation of temporary cytological slides (mitosis and meiosis)
2. Genetical problems on monoand dihybrid ratios with their modifications.
3. Chi-square test and goodness of fit of Mendelian modified ratios.
4. Practical record
5. Viva-voce

Course- V

Semester- I **1+1=2**

ELEMENTARY STATISTICS AND APPLIED MATHEMATICS

ELEMENTS OF STATISTICS (ICAR)

STATISTICS

Definition, Aims, Characteristics and Limitations of statistics, Classification and Tabulation of data.

Definition, advantages and disadvantages of Arithmetic Mean, Median, Mode; Geometric Mean, Harmonic Mean and Weighted Mean as measures of central tendency; and Range, Quartile Deviation, Mean Deviation, Variance, Standard Deviation and Coefficient of variation as measures of dispersion.

Definition of probability, Additive and Multiplicative Laws of probability and simple problems based on them. Definition, merits and demerits of sampling and Random Sampling. Concept of Standard Error. Basic concepts used in tests of Significance like Null Hypothesis, Degrees of freedom and Level of significance. Definition and uses of z and t-tests in testing significance of difference between two means; F-test in testing equality of two variances and (x2= test as a test of independence of attributes in 2x2 contingency table only.

Bais principles of Experimental Design. Description and Analysis of Completely Randomised Design (C.R.D.), Randomised Block Design (R.B.D.) and Latin Square Design (L.S.D.)

MATHEMATICS

Binomial Theorem for positive integral index only. Uses of Natural and common Logarithems. Exponetial Series. Limits and Differentiation (Without differentiation by first principles). Differentiation of algebraic, trigonometrical, logarithmic and exponential functions only, Logarithmic differentiation. Differentiation of products, quotients, function of functions, implicit and explicit functions.

Practical

Based on

1. Measures of Central Tendency
2. Measures of Dispersion
3. Tests of Significance
4. Analysis of CRD, RBD and LSD

Course-VI

Semester- I **1+1=2**

AGRICULTURAL METEROLOGY

Different meteorological variables related to agriculture.

Rainfall- Hydrologic cycle and it's components. Types and forms of precipitation. Storms, occurrence, variation and measurement of rainfall. Rain guages, Computation and analyses of data. Plotting of mass curve and rainfall, intensity curve.

Run-off- Definition, types, factors affecting, estimation and measurement of run-off.

Atmosphere - Definition and structure, climatre and weather, atmospheric pressure, factors affecting, measurement.

Elementary idea of insolation, Temperature, kinds and measuring instruments, evaporation, factors affecting, measurement

Humidity, definition, windvane, Anemo-meter.

Indian Agro Climatic Zones

Elementry idea of weather forecasting.

Practical

1. Computation of average rainfall.
2. Mass Curve
3. Plotting Bargraph for rainfall data.
4. Rainfall intensity curve.
5. Measurement of rainfall by Raingauge.
6. Measurement of Atmospheric Pressure.
7. Plotting line graphs for illustrating climatic factor such as temperature.
8. Measurement of Relative Humidity.
9. Study of wind vane and Anemometer.
10. Measurement of Evaporation by USDA evaporation pan.

Course-V

Semester- I **1+1=2**

RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

1. Definition and scope of rural sociology.
2. Basic concept of society, community and groups
3. Characteristics and Differences of rural and Urban communities
4. Basic rural institutions and their role in Agriculture development.
5. Definition and types of rural leadership and their role.
6. Definition, nature and importance of psychology in the development of human behaviour.
7. Meaning of habit and habit development.
8. Basic Psychological concepts; motivation, Social Interaction, Attitudes, Emotions, Prejudices and Social Perception.
9. Personality- definition and development.

Practical

1. Socio-economic survey of village communities.
2. Developing schedules and questionnaires.
3. Practical knowledge about the working of basic rural institutions.
4. Identification of important value systems in the rural setting as a means of social control.
5. Identification of rural personality traits that affect the development of personality in rural situation.

Course-VIII

Semester- I **2+1=3**

FUNDAMENTALS OF HORTICULTURE

Introductory knowledge of main branches of horticulture and their importance; Botanical classification of fruits; climatic fruit zones of Uttar Pradesh and fruits grown therein; Establishment of orchards; Selection of site, systems of planting; Orchard soil management; Systems of irrigation; Principles of pruning and systems of training of fruit plants; Unfruiffulness, its causes and measures to overcome it; fruit drop, its causes and measures to control it; rejuvenation of orchards, Brief studies of polyembryony, parthenocarpy and incompatibility.

Practical

1. Identification of garden tools and plants;
2. Preparation of orchard layouts for different climatic zone of U.P.;
3. Practice of propagation of major fruit plants;
4. Preparation and seed beds and raising of seedlings;
5. Practice of lifting and packing of nursery plants;
6. Visit to nurseries, gardens and research stations.

B.Sc. Ag., SEMESTER-II

Sl. No.	Department	Credit Hours	Title of the course
1.	Agriculture Engineering	1+1=2	Cereals Millets, and pulses crops (field crops Kharif Crops)
2	Agriculture Extension	2+1=3	Principal of plant breeding
3	Agriculture Botany	2+1=3	Form power and Machinery, farm Structures, Power and Machinery (ICAR)
4	Agriculture Entomology	1+1=2	Environmental Science Agro Ecology
5	Plant pathology	1+1=2	Agriculture marketing, export and cooperation
6	Agriculture soil	3+1=4	Vegetable Production
7	Agriculture Soil Chemistry	3+1=4	Elementary Microbiology and Soil microbiology

Course- I

Semester- II **1+1=2**

IRRIGATION AND WATER MANAGEMENT

1. Importance of water in crop production.
2. Soil Moisture constants.
3. Water requirement of crops and factors affecting it.
4. Approaches of irrigation scheduling.
5. Systems and methods of irrigation
6. Quantity and quality of irrigation.
7. Measurement of irrigation water.
8. Elementary idea of drainage on farms.

Practical

1. Measurement of irrigation water.
2. Determination of soil moisture content and quality of water.
3. Calculation on consumptive use of water.
4. Numerical exercises on drainage and irrigation requirement.
5. Calculation of irrigation water use efficiency
6. Visit to irrigation and drainage projects.

Course- II

Semester- II **2+1=3**

FUNDAMENTALS OF EXTENSION EDUCATION AND RURAL DEVELOPMENT

1. Extension Education:

(a) Meaning, definition, objectives, Principles, Scope, Philosophy and its distinguishing features.

(b) Extension Teaching and Learning : Teaching, Teaching Elements, steps in Teaching, Learning, Learning Situation, Basic Principles of Teaching and Learning.

(c) Early Extension Efforts in India.

(d) Comparative study of Extension Service in India and USA.

2. Community Development:

(a) Meaning, Definition and objectives of community development.

(b) Organisational set up and Activities of Community devIopment at State, District, Block and Village level.

(c) Extension and Rural Development Programmes : Including T & V system, National Demonstration, IRDP, Jawahar Rojgar Yozana.

3. Extension Programme Planning, Monitoring and Evaluation:

(a) Meaning, Principles and Procedure of Programme Planning.

(b) Definition : purpose, types, criteria and steps involved in monitoring and evaluation.

Practical

1. Practice in Conducting Survey
2. Practice in preparing schedule and Questionnaire for studying the organisational set up of community development.
3. Contact with the farmers and educating them in new technology of Agriculture.
4. Development programme for a village & a Block.
5. Preparation of an outline and practice on evaluation of a programme.
6. Classification, Tabulation and diagrammatic representation of data.
7. Writing study Reports.

Course- Ill

Semester- II **2+1=3**

ELEMENTARY CROP-PHYSIOLOGY

1. Role of plant physiology in agriculture.
2. Cell structure and function.
3. Physico-chemical phenomenon-diffusion, osmosis and imbibitions.
4. Essential nutrient elements, their role, deficiency sysptoms, mineral salt, absorption.
5. Photosynthesis - light and dark reactions.
6. Mechanism of respiration, transpiration
7. Fat metabolism, synthesis of fatty acids, glycerole and their condensation.
8. Assimilation of nitrogen in plants.
9. Plant growth substances, photoperiodism and vernalization.

Practical

1. Experiments on diffusion, osmosis and imbibition.
2. Determination of transpiration rate by potometers.
3. Extraction of photosynthetic pigments, separation of chlorophyll "a" and "b" and carotenoides.
4. Experiments on factors affecting rate of photosynthesis (CC, light and temperature).
5. Determination of photosynthetic and respiration rates through portable CO2 gas analyser.

Course- IV

Semester- II **1+1=2**

INTRODUCTORY ENTOMOLOGY

1. General introduction to Phylum-Arthropoda, its various classes and their distriguishing characters with particular reference to class lnsecta
2. Insect Morphology: Body wall-structure, composition and functions; Body divisions-Head (Structure and its appendages; structure, functions and modifications of antinae; Mouthparts-Biting and chewing, piercing and sucking, sponging, siphoning, chewing, and lapping); Thorax-its structure and appendages, modifications and functions of legs and wings, wing coupling apparatus and wing venation; Abdomen-its segements and appendages.
3. Anatomy: Digestive, Excretory, Reproductive, circulatory, respiratory and nervous systems of grass hopper.
4. Sense organs : Structure and functions of ocelli, compound eye and johonston's organ.
5. Post-embryonic development including ecdysis, instars, types of larvae and pupae. Different types of metamorphosis.
6. Taxonomy: Insect Classification upto the level of families of agricultural importance of following orders:

Orthoptera : Acrididae;

lsoptera : Termitidae;

Hemiptera : Coreidae, Pyrrhocoreidae, Lophopidae, Aleurodidae, Jassidae, aphidae, Coccidae, Lacciferidae,

Coleoptera : Dermestidae, Coccinellidae, Bruchidae Chrisomelidae; Curculionidae, Tenebrionidae, Scarabaeidae;

Lepidoptera : Gelechiidae, Pyralididae, Noctuidae, Cymbidae, Papilionidae, arctiidae and Bombycidae;

Hymenoptera : Tenthredinidae and Apidae

Diptera : Trypetidae

Practical

1. Dissection of Grasshopper for the study of digestive, reproductive and nervous system.
2. Study and Temporary mounting of external parts of grasshopper.
3. Identification and comments upon the various Arthropods with special reference to class Insecta.
4. Collection and preservation of insects.
5. Viva-voce and practical records.

Course- V

Semester- II **1+1=2**

INTRODUCTORY PLANT PATHOLOGY

1. Definition and importance of plant pathology.
2. Causes of plant diseases.
3. Classification of plant diseases according to cause and occurrence.
4. Plant Pathogens:

(a) Fungis

(i) Economic importance and general characteristics.

(ii) Morphology of different vegetative structures (thallus, mycelium, haustoria, etc.)

(iii) Reorduction

(iv) Different types of spores.

(v) Levels of parasitism

(vi) Nomenclature

(vii) Classification of fungi with special reference to genera listed under item (viii) Life histories of Pythium, albugo. Erysiphe, Ustilago Clareicaps and Puccinia.]

(ix) Diagnositic characters of the following genera, Phytophthora, Peronospora, Sclerospora, Ustilago, Sphacelotheca, Tolyposporium, Melampsora, alternaria, Cerospora, Fusarium, Helminthosporium Pyricularia, Rhizoctonia, Colletrotrichum.

(b) Bacteria:

(i) Brief history of bacteria as plant pathogens.

(ii) Morphology and Cell structure.

(iii) Vegetative reproduction.

(iv) Brief outline of classification of plant pathogenic bacteria.

(v) A brief account of mycoplasma.

(c) Viruses

(i) Nature and properties.

(ii) Transmission of plant virus

(d) Phanerogamic parasites: Cucuta, Loranthuus, Orobanche and striga.

Practical

1. Temporary slide preparation of representative genera of disease causing fungi for morphological studies
2. Simple staining of bacteria from milk and curd
3. Preparation of PDA
4. Practical record
5. Viva voce

Course- VI

Semester- II **3+1=4**

ELEMENTARY PLANT BIOCHEMISTRY AND CHEMISTRY OF PLANT PRODUCTS

1. Scope of biochemistry.
2. Carbohydrates - Definition, Classification, Chemistry and Structural formula of the following

(a) Monosaccharides - D Glucose, D. fructose, D. Galactose

(b) Oligosaccharides - Sucrose, Maltose, Lactose.

(c) Polysaccharides - Starch, Cellulose, Inulin.

3. Proteins - definition, classification, composition, important functions Primary and secondary Structure of protein, Biological significance of proteins.
4. Amino acids - Classification, properties of Amino acids structure of the following amino acids- Glycine, Tryptophane, Aspartic acid, serine, lysine, Histidine, Methionine, protein; Essential and non-essential amino acids, Nutritional significance of amino acids.
5. Lipids- Definition, classification, properties and structural formula of the following saturated fatty acids (Butyric acid, caproic acid, palmitic acid, stearic acid) and unsaturated fatty acid (oleic acid, Liniolenic acid, erucic acid).
6. Enzyme - Occurrence, nomenclature, classification, mechanism of action, general properties and factors effecting the rate of enzyme action, coenzyme-A.
7. Vitamins - Classification, biochemical functions and structural formula of vit. A, thiamine, raboflavin, Vit. B12 Ascorbic acid, vit. D.
8. Phytohormones - Occurrence, structure and functions of important plant growth substances viz. Auxins, gibberellins, cytokimuis and Abscisic acid.

9. Alkaloids - Occurrence, classification, uses general properties and Biological significance of alkaloids. Structural formula of Conine Nicotine and Papaverine.
10. Nucleic acid - structural formula of Pyrimidines and Purines, Nucleosides and N<ucleotides Watson and crick model of DNA.

Practical

1. Qualitative test of important sugars, proteins and alkaloids.
2. Estimation of starch in plants.
3. Estimation of reducing and non reducing sugars in cane juice and jaggery.
4. Separation and identification of amino acid by paper chromatography.
5. Iodometric titration.
6. Estimation of Diastase enzyme in plants.
7. Estimation of Ca by EDTA method.

Course- VII

Semester- II **3+1=4**

INTRODUCTION TO AGRICULTURAL AND NATURAL RESOURCE ECONOMICS AND FARM MANAGEMENT ECONOMICS

A. Natural Resource Economics

1. Definition, subject matter and scope of economics.
2. Micro Economics and Macro Economics within both static and dynamic framework.
3. Definition, subject matter and significance of agricultural economics.
4. Primitive and scientific Agriculture. Characteristics and Indian agriculture; major problems including causes of low productivity.
5. Economic Development, role of agriculture Technological change in agriculture and various inter-relationships.
6. Task of an economic system, role of economic theory in agriculture.

Production:

Basic production problems production function, productivity curves; relationships thereof, intensity of resource use, law of diminishing returns, output- elasticity, homogeneity in production functions.

Consumption:

Theory of demand, demand curves, consumption function, Elasticity, Utility Analysis, Indifference Curve, Consumer's surplus.

B. Natural Resources

Meaning, Geographical situations, Topography and crops (Agro zones), Temperature and plant growth, Land and land use, culturable waste land crop rotations, cropping scheme and cropping intensity. Forest- Classification, causes of deforestration. Functions of forests. Forestry programmes of the Indian Government Water Irrigation sources, progress, Misuse of irrigation water. Application of economic laws to irrigation, growth and utilization of irrigation potential, Command Area-meaning and Functions of water Managements. Management of irrigation water. Ongoing projects including watershed management programme. Utilized groundwater resources.

C. Farm Management Economics

1. Definition and scope of farm economics and management
2. Farm Management and production economics. Agricultural Economics and industrial Economics-Similarities and differences.
3. Management decisions and cultivators' holdings. Economic Principles their role in farm management. Application of economic Principles/Laws.
4. Law of Diminishing, Returns/Principle of variable Proportions laws of return, scale properties, Law of Equi-mangiral Returns, Law of such situation, opportunity cost/opportunity Returns, Law of comparative advantage.

5. Production Function, productivity curves, least cost combination of inputs, Principle of conbining Enterprises Determination of Optumum output.
6. Cost concepts and Principles, Cost Relationship and curves.
7. Time Comparison (Compounding and discounting of costs). Allocation of Over-head and command costs.
8. Profit Maximization.
9. Measures of form profit.
10. Farm Records and Accounts.
11. Methods of valuation and depreciation of assets.
12. Types of farming : Diversified, General farm, subsistence or Marginal farming, specialized farms, Mixed farming, Ranching and Dry farming.
13. Systems of farming Cooperative farming, peasant farming, state farming, collective farming, capitalistic farming.
14. Tools of Farm Management : Farm Budgeting (Complete and partial budgeting) and farm planning, Linear Programming (Graphical method).
15. Definition of Institute and University Types of uncertainty in agriculture (Price uncertainty, yield uncertainty, innovation uncertainty Social and legal frame as a source of uncertainty). Diversification (complementary and supplementary relationships) as a mechanism to minimize uncertainty), crop and cattle insurance, pumpset insurance Arguments for and against.

Practical:

1. Socio-economic survey and collection of data, classification and tabulation with special reference to natural resources of a village.
2. Study of a farm holding (resources, enterprises, costs, profit and complete farm economy) of the allotted farmer by cost-accounting method.
3. Preparation of an alternative farm plan for the farmer.
4. Submission of Report.

B.Sc. Ag., SEMESTER-III

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Cereals Millets, and pulses crops (field crops Kharif Crops)
2	Agriculture Botany	2+1=3	Principal of plant breeding
3	Agriculture Engineering	2+1=3	Form power and Machinery, farm Structures, Power and Machinery (ICAR)
4	Soil Conservation	2+1=3	Environmental Science Agro Ecology
5	Agriculture Economics	2+1=3	Agriculture marketing, export and cooperation
6	Horticulture	2+1=3	Vegetable Production
7	Agriculture Soil Chemistry	2+1=3	Elementary Microbiology and Soil microbiology
8	Agronomy	0+1=1	Practical crop production

Course- V

Semester- III **2+1=3**

CEREALS MILLETS, AND PULSES CROPS

(Field Crops Kharif Crops)

Importance, origin, distribution climate varieties soil practices, manuring and irrigation, plant protection, harvesting and processing of the following crops, under different agroclimatic conditions of U.P.

A.	Cereal Crops	:	Paddy, Maize
B.	Millet Crops	:	Sorglum,
C.	Oil seed	:	Groundnut, Til, caster
D.	Pulses Crops	:	Pigeon Pea, Urobean, Moongbean, Soyboan, Cowpeft.
E.	Fibre Crops	:	Cotton, Jute, Suhhemp, Mesta
F.	Green Manure crops	:	Sun hemp and Dhencha
G.	Fodder Crops	:	Sorghum, Pearhmillet, Maize, Napier, Sudan grass, cluster, bean, cowpen
H.	Cash crops	:	Sugarcane, Tobaceo

Practical

1. Identification of crop-seeds, plants associated weeds.
2. Practical knowledge of operations from sowing to harvesting of kharif crops included in theory course.
3. Judging of maturity and estimation of yields.
4. Study of crop production techniques at different farms.
5. Calculation of seed and fertilizer requirement of crops.
6. Preparation of seed beds of important crops.
7. Visit to farms of University and Institutes.

Course- II

Semester- III **2+1=3**

PRINCIPLES OF PLANT BREEDING

1. Plant Breeding-history, objectives and scope.
2. Mode of reproduction in crop plants in relation to breeding techniques.
3. Plant variation kind and causes.
4. Genetic consequences of self and cross pollinated crops.
5. Plant Introduction and exploration.
6. Breeding cross pollinated cropspureline, mass selection, pedigree, bulk and back cross methods.
7. Male sterility and its importance.
8. Breeding of asexually propagated crops, Clonal selection and apomixsis.
9. Polyploidy and mutation breeding.

Practical

1. Technique of emasculation and artificial pollination in important crops.
2. Skeleton of different breeding procedures.
3. Practical record.
4. Viva-voce.

Course- VI

Semester- III **2+1=3**

FARM POWER AND MACHINERY

FARM STRUCTURES, POWER AND MACHINERY (ICAR)

1. Farm structures farm site, food storage structure Breeding materials farm house, dairy building poultry housing.
2. Elementary knowledge about the engineering terminology and calculations on piston displacement compression ratio, hip and Licenses of engines construction and working of four stroke and two stroke cyclic engines common engine tables causes and their remodes.
3. classification of tractors elementary knowledge about following main components of tractor and their functions steering clutches, transmission different and final drive brakes, bolt, pulley PTO, shift and hydraulic lift methods of starting and stopping of tractors. General care and maintenance.
4. Study of simple parts operation and installation of anelectric meter (Induction type, eniyl, calculation of HP units consumed Role of switches fuses and strater,
5. Study of construction working principles toubles and adjustments of the following machines.

Discplough dischonow seed drill planter reaper mower threshers combine spresyes and dusters calculation of area covered power requirement and efficiency of above machines.

Practical:

1. Preparation of layout for farm houses dairy barn and poultry housing.
2. Study of construction of four stroke and two stroke cycle engines operating and running of diesel engines.
3. Study of tractors systems tractor driving practice.

4. Study of disc plough, study of seed drill plants and its calibration, study of throsher and combine.
5. Visits to places of engineering interest.
6. Identification of different work shop tools and machines and their used.

Course- IV

Semester- Ill **2+1=3**

ENVIRONMENTAL SCIENCE AGRO ECOLOGY

1. Ecology - definition, division and significance.
2. The Environment - environmental management and control of pollution, affecting plant growth a biotic and blanic isotere interaction.
3. Ecosstom major ecosystems, energy and its flow in ecosystem biochemical cycles and nutrient cycles.
4. Plant community - classification composition, and study of plant community structure.
5. Plant adoption - ecological classification of plants and their morphological anatomical and pysiological adaptations to adverse environments hyd rophytes, xerophytes, mesophytes, apiphytes and holophyos
6. Ecological problems of major crops-cereals, millets, pulse and oilseeds Practical

1. To record temperature, relative humidity and light intensity value of the atmosphere.
2. To study the community by quadrat method by determining plant structure different specie crops.
3. To study the getution of the givne area by a phyoloycoinic method biological spectrum method.
4. To determine the biomass producers in the given area.
5. To record abiotic components- pH, temperature, light intensity, turbidity is pond ecosystem.

Course- VII

Semester- III **2+1=3**

AGRICULTURE MARKETING, EXPORT AND COOPERATION

A. Agricultural Marketing:

1. Market, Meaning, scope and classification of markets. Definition of agricultural marketing, demand, supply and price.
2. Marketable surplus, marketed surplus. Integrated marketing.
3. General theory of markets and marketing.
4. Demand for agricultural products.
5. Production and market supply.
6. Price Determination and price analysis under different market structures.
7. Marketing Functions and services.
8. Marketing costs margins and efficiency.
9. Defects of Present system of marketing of agricultural produce. Steps taken by the Indian Government and possibilities of improvements.
10. Fixation of agricultural Prices.
11. Marketing Institutions: Regulated and cooperative markets.
12. Market Research.

B. Export.

1. The concept of export as a district business activity in agricultural sector of the Indian economy, its importance and role in economic development.
2. Policies of export of food grains and agricultural commodities pursued by the ndian Government.
3. mport vs. export value of cereals and other agricultural commodities.
4. gencies engaged in exporting agricultural goods.

C. Cooperation

1. Maning and Concept of Cooperation, principles of Cooperation (Equality,niversality, distributive, justice, democracy, unity, honorary

services voluntaryism). Place of thrift in cooperation, economic planning and cooperation.

2. History and Progress of cooperative movement in India.
3. Structure and organisation of agricultural cooperation in India.
4. National cooperative federations, courses of slow growth of agricultural cooperatives, suggestions for rapid development. National Bank for Agriculture and Rural development (1982).
5. Cooperative farming : Meaning thereof, New classification cooperative farming, cooperative joint farming, cooperative collective farming. Advantages thereof. Reasons for apathy of farmers in adopting cooperative joint farming.

Practical

1. Survey of a market (mandi) both primary and secondary (atleast one each).
2. Case studies of marketing of a minor and a major commodity w.r.t. marketing channels costs margin and price spread over.
3. Study of a (i) cooperative marketing society (ii) a warehouse functioning market (iii) a regulated market and (iv) a cold storages.
4. Submission of a report on the above four aspects.

Course- VI

Semester- III **0+1=1**

VEGETABLE PRODUCTION

Importance and scope of vegetable production in India; Classification of vegetables. Types of vegetable gardens; Culture and seed production of major vegetable like Potato, Brinjal, chillies, tomato, Cauliflower, Cabbage, Onion, Bottle, gourd, Musk melon, watermelon, Okra, Radish, Carrot and Pea.

Practical

1. Nursery raising of vegetable crops.
2. Production of seeds in vegetable available at the time of course.
3. Cost of cultivation studies in Potato, Tomato, Cauliflower and Okra.
4. Production oriented training in cultivation of vegetable crops.

Course- VII

Semester- III **0+1=1**

ELEMENTARY MICROBIOLOGY AND SOIL MICROBIOLOGY

1. Definition, scope and importance of microbiology.
2. A brief survey of microbiology:
   (i) Prokaryotes and Eukaryotes.
   (ii) Types of microorganisms : algae, protozoa, fungi, bacteria and viruses.
   (iii) Size relationships.
3. Simple staining and gram staining techniques of bacteria.
4. Characteristics of gram positive and gram negative bacteria.
5. Classification of bacteria (only important groups)
6. An elementary idea of general characteristics, classification and reproduction of fungi, algae and protozoa.
7. Biogeochemical cycles: Nitrogen, Carbon, Sulphur and Phosporous cycles.
8. General structure of bacteriophage and replication.
9. Sterilization and disinfection.

Practical

1. Study of different parts of light compound microscope and their functions.
2. Gram staining of bacteria.
3. Preparation of nutrient broth, Czapek's and Richard's media.
4. Identification of algae, fungi and protozoa.
5. Practical record
6. Viva voce.

Course- VIII

Semester- III **0+1=1**

PRACTICAL CROP PRODUCTION

In this course, team of about 10 students will be given a sizable plot of land (100 sq.m. minimum) for a full year. The team will manager crop production enterprise from a to z including maintenance of account and preparation of balance sheet. No paid labours will be supplied and other inputs will be supplied on loan and their cost will be deducted from the receipt of the enterprise. The net profit will be distributed among the students. To cope with natural calemilies a revolving fund will be raised by deducting 10% amount from net profit every year. The evaluation of students will be done on the basis of actual working units, share in profit, oral examination and maintenance of accounts and records.

B.Sc. Ag., SEMESTER-IV

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Oil seeds commercials crops fields crops-II Rabi crops (ICAR)
2	Agriculture Botany	2+1=3	Breeding of field crops
3	Soil Conservation	2+1=3	Principles of soil physics and conservation soil survey/land planning and remote sensing (ICAR)
4	Animal Husbandry	2+1=3	Livestock production and management (including poultry) lives stock production India poultry swine and goa farming along with animal diseases (ICAR)
5	Entomology	2+1=3	Economic Entomology, Economic entomology including crops (ICAR)
6	Horticulture	2+1=3	Fruit production fruit production including plantation crops (ICAR)

Course- I

Semester- IV **2+1=3**

OIL SEEDS COMMERCIALS CROPS

Field Crops II

RABI CROPS (ICAR)

Importance, origin, distribution, climate, varieties improved, agronomic practices managing and irrigation, plant protection, harvesting and processing of the following crops under various agroclimatic conditions of U.P.

A.	Cereal Crops	:	Wheat, Barley, Oat
B.	Oilseed Crops	:	Rapeseed and mustard Linseed, Sunflower
C.	Pulse crops	:	Chickpea, fieldea Lantil, Rajmash
D.	Fodder Crops	:	Oat, Berseem Lucene
E.	Cash Crops	:	Potato Mentha

Practical

Studies the practical course for the field crops I with suitable allegation of crops included in the syllabus.

Course- I

Semester- IV **2+1=3**

BREEDING OF FIELD CROPS

1. Origin, distribution and objectives.
2. Breeding problems, systematic description and economic importance.
3. Breeding methods adopted and achievements with reference to following crops:

(a)	Cereals	:	Wheat, rice and maize
(b)	Millets	:	Sorghum and pennisetum
(c)	Pulses	:	Gram, Pea and arhar
(d)	Oil-seeds	:	Mustard, groundnut and sunflower
(e)	Others	:	cotton and potato

Practical

1. Identification of important varieties of above mentioned cvorps.
2. Systematic description and artificial hybridiation and above mentioned crops.
3. Significant research advances made in above mentioned corps.
4. Practical record
5. Viva-voce.

Course- I

Semester- IV **2+1=3**

PRINCIPLES OF SOIL PHYSICS AND CONSERVATION

SOIL SURVEY/LAND PLANNING AND REMOTE SENSING (ICAR)

Physical properties of soil and their determination.

Definition and importance of soil conservation in agriculture. History and soil conservation in India.

Soil survey, definition Land use capability classification different types of soil in India.

Soil erosion, definition types, mechanics and causes of eerosion. Factors affecting soil erosion. Agronomical practices for soil and water conservation. Engineering practices for erosion control such as bunding, terracing, temporary and permanent structure for Gully control. Grassed water ways. Water harvesting.

Wind erosion mechanics, control, sand dune fixation, shifting cultivation.

Survey, measurement of distance direction and elevation.

Role of grosses and forests in soil conservation, farm forestry, social forestry.

Practical

1. Fomiliarization with chain survey equipments.
2. Exercises on chain survey.
3. Familiarization with prismatic compass (P.C.)
4. Open traversing by chain and P.C.,
5. Closed traversing by Chain and P.C.
6. Calculation of included angles.
7. Study and adjustment of Dump level (D.L.)
8. Differential leveling by D.L.
9. Profile leveling by D.L.
10. Calculation of Reduced level.
11. Construction and design of bunds with calculation of earth work.]

12. Calculation of infiltration rate and bulk density.
13. Visit to soil conservation research centre for erosion and control.

Course- IV

Semester- IV **2+1=3**

LIVESTOCK PRODUCTION AND MANAGEMENT (INCLUDING POULTRY)

LIVES STOCK PRODUCTION INDIA POULTRY SWINE AND COAT FARMING ALONGWITH ANIMAL DISEASE (ICAR)

General:

Importance of livestock in Agriculture Relationship of plants with animal husbandry. Dairying under specialized and mixed farming. Livestock and milk Production statistics, milk distribution.

Dairy cattle & Buffalows management:

Breeds, Breeding methods and systems, care and management of milich cows at after calving; Raising of calves, management of heifers and bulls maintenance of livestock records milking methods and principles. Clean milk production. Pasture management. Housing for dairy animals.

Pig Management

Importance, important Breeds, raising piglets upto age of slaughter. General aspects of breeding, care of sow and boqr.

Seep/goat management:

Importance, important breeds, raising to kids/lambs, breeding, feeding of goats/sheep

Poultry production:

Importance, important breeds, General aspects management of raising broilers and layers, feeding of different class of birds, Grading of eggs and preservation.

Diseases:

Signs of illness, control measures of disease, classification of diseases. Modes of transmission, prevention and treatment of disease of bovine (HS, RP, BO, Anthrax, Brucelloses, Johne's. Mastitis, Milk fever, FMD), Sheep and goats (enterotoxaemia, coccidiiosis, ascariasis), pigs (Swine fever, Hog

chotern) and poultry (Ranikhet, fowl pox, CRD, Marex, Gumbaro). Vaccination programme for cattle and poultry.

Practical

Study of external body parts, study of phenotypic and physiological different between cow and buffaloes, zebu, vs. Taurus, estimation of body weight measurements, marking for identification castration, dehorning. Estimation of judging cost of milk production problems on soil capacity, computation of mediation ration mixing of feeds, casting and throwing, Grooming, Preparing scheme of round the year defermining temperature pulse and animals.

Course- III

Semester- IV **2+1=3**

ECONOMIC ENTOMOLOGY

ECONOMIC ENTOMOLOGY INCLUDING FISHERY (ICAR)

1. Economic importance of insects, nature and extent of damage, life history and management of the major insect pests of following crops as mentioned against them:

Paddy	Leptocorisa variconis, Hieroglyphus Spp., Nilaparvata lugens, Nephotetix, spp., Mythimna separate.
Jower Maize	Chilo partellus, Atherigona varascoccate.
Sugarcane	Tryporyza novella, Emmalocera depressella, Pyrilla prepussila, Aleurolobus barodensis.
Cotton	Pectinophora gossypiella, Earias Spp., Sylepta derogala, Dysdercus Spp., Bomisia tabci, Amrasca blouttula.
Oilseeds	Lipaphis erysimi, Athalia proxima Bagrada Cruciferarun Dasyneura lini.
Pulses	Helicoverpa armigera Agrotis Spp., Etiella Zinckenella, Melanagromyza obtuse, Phytomyze atriornis.
Pests of Fruit crops	Drosicha Mangiferae idioscopus Spp., Papilio Demeclius, Diaphorina citri Phyllocnistis citrelia, Otheris Spp. Virechois isocrates. Eriosoma lanigerum. Quadraspidiotus permincousus.
Pest of Vegetable Crops	Leucinodes orbonalis, Epitachna viontioclopunctate. Raphidoplapa foveicollis, Dacus Cucurbitae, Plutella Xylostella.
Pests of Stored Grains	Sitophilus oryzae, Trogoderma granarium, Tribullum castaneum, sitotroga cerealella, callsobruchus

	chinensis
Polyphagus pests	Odontotermes abesus, Schistocerca gregaria, Holotirichia consanquincea spilosoma oblique, spodoptera litura, Amsecta Spp.

2. Elementary knowledge of agriculture and lac culture.

Practical

1. Collection, mounting and preservation of insect pests of crops stages.
2. Filed and laboratory acquaintance withinsect pests, the various srages and damaged materials.
3. Technical knowledge of honey, silk and lac prodsuction.
4. Filed application of insecticidal formulations.
5. Practical records and Viva-voce.

Course- VII

Semester- IV **2+1=3**

FRUIT PRODUCTION FRUIT PRODUCTION INCLUDING PLANTATION CROPS (ICAR)

Importance, scope and present position of fruit and plantation corps in India, Practices involved in the production of truits : Mango, Guava, Kagzi lime, banana, Grape, Litchi, Papaya, Loquat, Aonla, Ber, Jack Fruit, Apple and Peach; Production techniques of plantation crops : Coconut, Cashew nut, Tea and coffee.

Practical

Identification of fruits; and plantation crops; Orchard layout and palnting; Practice of different propagation methods with special reference to fruits; Practice of training and pruning of fruit plants; Plant protection practices; visit to orchards, nurseries and research centers of fruits and plantation crops.

B.Sc. Ag., SEMESTER-V

Sl. No.	Department	Credit Hours	Title of the course
1.	Botany	1+1=2	Introduction to plant biotechnology
2	Dairy	2+1=3	Milk and milk processing, principles of food science and human nutrition (ICAR)
3	Horticulture	2+1=3	Preservation of fruits and vegetables post harvest management of fruits and vegetables (ICAR)
4	Entomology	2+2=4	Crop pests and integrated pest management crops pests and management (ICAR)
5	Agronomy	1+1=2	Weed management.
6	Pathology	2+2=4	Crop disease and their management plant pathology : crop diseases and management (ICAR)
7.	Soil Chemistry	2+1=3	Soil fertility, fertilize and integrated nutrient management (ICAR)

Course- I

Semester- V **1+1=2**

INTRODUCTION TO PLANT BIOTECHNOLOGY

1. Definition scope and importance of plant biotechnology.
2. Outlines of basic steps involved in plant, biotechnology/genetic engineering such as:
   - (a) Isolation of plant DNA and vector DNA
   - (b) Restriction of DNA of endonucleasses.
   - (c) Electrophoresis of restricted DNA fragements.
3. Cloning vectors for recombinant DNA such as-
   - (a) Ti-plasmic vector for higher plants.
   - (b) Plant viruses such as cauliflower mosaic virus (Ca MV), tobacco mosaic virus (TMV) and gemineae virus as vectors.
4. Application of plant genetic engineering in crop improvement.
5. Plant tissue culture.
   - (i) Culture media used in plant tissue culture.
   - (ii) Somaclonal and gametoclonal variation in plants.
   - (iii) Micro-propagation of plants.
   - (iv) Application of plant tissue culture in crop improvement.

Semester- V **1+1=2**

MILK AND MILK PROCESSING PRINCIPLES OF FOOD SCINCE AND HUMAN NUTRITION (ICAR)

1. Milk and its secretion, composition of colostrums and milk of differect species. Physical properties of clostrum, cow and buffalo milk. Factors affecting the quantity and quality of milk produced. Clean milk production, microorganism of milk and their functions. Agencies engaged in handling and transportation of milk pricing of milk.
2. Processing the milk. Filteration, Clarification bactofugation pasteurization ultra high temperature treatment, homogenization, sterillzation, cooling and chilling of milk. Membrane filteration and revese oxmosin processes. Common adultery ants and preservatives used in milk and their detection.

Practical

1. Sampling of milk
2. Determination of specific gravity by lactometer and west phal balance. Fact test by Gerber's method solid and SNF percentage by Richmond's scale and formula.
3. Assessment of quality of milk by simple casts like C.O.B. Alcohal test, and Sediment test.
4. Determination of acidity of milk.
5. Calculations on standardization and adultereation of milk.
6. Detection of common milk adulterants.

Course-III

Semester- V **1+2=3**

PRESERVATION OF FRUITS AND VEGETABLES POST HARVEST MANAGEMENT OF

Importance and scope of post harvest management of fruits and vegetables post, harvest deterioration of fruits and vegetables Techniques of prolonging the life of fruits and vegetables; handing grading and packing of fruits and vegetables.

Fruits Preservation

Causes of Spoilage of Fruits and Vegetables principles and methods of fruits and vegetables preservation canning of pea; Dehydration of fruits and vegetables; tomato products; jam, jelly and squash; preserve of Aonla and Bael; pickles of mango citurs, chillies and mixed vegetables.

Practical

Practical knowledge of harvesting, handling, grading. Precooling, waxing and use of chemicals to prolong the post harvest life of fruits and vegetables. Visit to storage and centers carrying improved practices of post harvest handling.

Bottling of green peas; dehydration of seasonal fruits and vegetables, preparation of apple jam, guava and karonda jellies; preparation of lime and orange squashes, Aonla and Beal preserve. Tomato Juice and ketchup.

Course-IV

Semester- V **2+2=4**

CROP PESTS AND INTEGRATED PEST MANAGEMENT

CROPS PESTS AND MANAGEMENT (ICAR)

1. Basic principles of pest out- breaks and their economic status.
2. Methods of insect control; including mechanical. Physical, cultural, biological, legal and chemical control use of insecticides repellents and antifieedants. Attractants. Chemosterilants. Pheromones, insect growth regulators.
3. Basic concept of integrated pest management.
4. Elementary knowledge of plant protection equipments.
5. Plant protection organization at the state and national level.
6. General account of non-insect pests with particular reference to rodents. Naeatodes. Mites and mollusks.
7. Insect vectors transmitting plant diseases.

Practical

1. Collection and preservation of established predators and parasistes.
2. Field and laboratory acquaintance with non-insect pests and their damaged materials.
3. Dilution and application of insecticides.
4. Handling of plant protection equipments.
5. Practical record and viva-voce.

Course-V

Semester- V **2+2=4**

WEED MANAGEMENT

(A) Definition, classification and general characteristics of weeds, Losses caused by weeds.

(B) Principles and methods of solving weed problem.

(C) Weed control schedules for important field corps of U.P.

(D) Integrated weed management system and its importance.

(E) Control of Abnoxious weeds viz. Sedge grass, Kane, Baisuri and satyanasi.

1. Identification and preservation of important weeds of locality.
2. Calculation on quantities of herbicides, weed control efficiency and weed index.
3. Calculation of cost involved in different weed control schedules.

Course-VI

Semester- V **2+2=4**

CROP DISEASE NAD THEIR MANAGEMENT PLANT PATHOLOGY: CROP DIEASES AND MANAGEMENT (ICAR)

1. General Symptoms of plant diseases.
2. Methods of plant diseas control.
3. Preliminary knowledge of different groups of fungicides.
4. Study of the symptoms, etiology, mode of perpetuation and control of the following disease:
   - (i) Early and late blights of potato.
   - (ii) White rust of crucifers.
   - (iii) Green ear disease and Ergot of bajra.
   - (iv) Powdery mildew, loose smut, karnal bunt and rusts of wheat.
   - (v) Coveredd smut of barely.
   - (vi) Grian smut of Jowar
   - (vii) Bajra smut
   - (viii) Rust of linseed
   - (ix) Let shos of tikka disease of groundnut
   - (x) Wilt of arher
   - (xi) Stripe diease of barely
   - (xii) Red rot of sugarcane
   - (xiii) Blast of rice.
   - (xiv) Citrus canker
   - (xv) Kharia disease of paddy and Black tip of mango.
   - (xvi) Tobacco mosaic
   - (xvii) Yellow vein mosaic
   - (xviii) Yellow vein mosaic of bhindi
   - (xix) Bean common Mosaic
   - (xx) Mosaics of potato
   - (xxi) Little leaf of brinjal.

Practical

(i) Diagnosis of important disease by studying symptoms.

(ii) Microscopic examination of diseased parts.

(iii) Preparation of Bordeaux mixture.

(iv) Practical record

(v) Viva voce.

Course-VII

Semester- V **2+1=3**

SOIL FERTILITY, FERTILIZES AND INTEGRATED NUTRIENT MANAGEMENT (ICAR)

1. Soil fertility concept, soil productivity, cactors influencing soil fertility, maintenance of soil productivity.
2. Essential plant nutrients, Criteria of essentiality, functions, deficiency Symptoms, Critical levels of deficiency and toxicity.
3. Mechanism of uptake and transport of minerals salts in plants.
4. Soil fetility evaluation, soil and plant analysis, tissue tests.
5. Mineralization and immoblilization of N and fixation and availability of P and K in soil.
6. Fertilizers- definition, classification, characteristics, reactions of fertilizer in soil, important fertilizer elements- Nitrogen, phosphorus, potassium, sulphur, zinc, Mixed and complex fertilizers Manufacture of urea, ammonium sulphate, superphoshate and marinate of potash. Organic sources of nutrients, digested sludge, manure, compost and green manures.
7. Elementary idea of biofertilizers.
8. Integrated nutrient management (INM) concept. Elementary idea of INM models, integrated nutrient management and soil health.

Practical

Analysis of N. P. and K in fertilizers. Determination of availability of NPK and S in soil. Elementary idea of determination of micronutrients in soil. Plant Tissue tests.

B.Sc. Ag., SEMESTER-VI

Sl. No.	Department	Credit Hours	Title of the course
1.	Botany	1+1=2	Principles of seed technology oil seed and commercial corps (ICAR)
2	Dairy	2+1=3	Dairy products technology
3	Engineering	2+1=3	Post Harvest Engineering.
4	Agronomy	2+0=2	Farming system and sustainable agriculture crop planning farm manage and sustainable agriculture. (ICAR)
5	Agriculture Economic	2+1=3	Agriculture Finance, Business management and trade
6	Agriculture Extension	2+1=3	Communication, Diffusion of agriculture innovation History and development of agri. Research and communication and difiusion of agri. Innovation (ICAR)
7.	Pathology	0+1=1	Plant Pathology: Mushroom cultivation Mushroom culture and elementary plant nemeology (ICAR)

Course-I

Semester- VI **1+1=2**

PRINCIPLES OF SEED TECHNOLOGY OIL SEED AND COMMERCIAL CROPS- (ICAR)

1. History and importance of seed technology.
2. Classes of seeds.
3. Characteristics of quality seeds and its importance.
4. General technique of seed production in important agricultural crops.

(i)	Cereals	-	wheat, rice, barley
(ii)	Pulses	-	maize, sughum and bajra
(iii)	Pulses	-	chichkpea, pigeonpea, fieldpea, urdbean, mung bean and lentil
(iv)	Oil Seeds	-	raps seed, mustard, groundnut, sesamum, Castor, sunflower and soybean.
(v)	Commercial corps	-	sugarcane, jute and coconut.

5. Factors affecting seed longevity and quality.
6. Causes of seed deterioration with reference to genetic and storage.
7. Seed resting- importance, procedures, purity, viability and germination.
8. Certification procedure for important filed crops.

Practical

1. Maintenance of seed purity in the field.
2. Field inspection procedure in important crops.
3. Demonstration of seed processing of important corps.
4. Viability and vigour test.
5. Analysis of purity, moisture and germination of seed samples and communication of results.

Course-II

Semester- VI **2+1=3**

DAIRY PRODUCTS TECHNOLOGY

1. Definition, composition and method of manufacture of cream, butter, dahi, khoa, Chhena, Ice cream, condensed milk powder, cheddar and cottage chease, common adulterants of Ghee and khoa and their detection, cleaning and saitization of dairy equipments.
2. Basic principles of refrigeration and cold storage of milk products, Principles. Of cooling and heating head transfer equipments.
3. Nutritive value to milk and milk products.

Practical

1. Demonstration of cream separation.
2. Demonstration of preparation of butter, Ghee, Khoa, Chhena, Ice Cream and dahi.
3. Calculation on Ice cream mix.
4. Calculation on standardization and Neutritralization of cream, run of butter and ice cream.
5. Comparative study of cost of different milk products.

Course-V

Semester- VI **2+1=3**

POST HARVEST ENGINEERING

1. Importance and advantages of processing of agriculture produce.
2. Study of process and equipments involved in cleaning drying. Storage of farm produce. Rice milling, Pulse-milling, wheat milling, oilseed milling, soyabeen processing cane- crushing, Chaff cutting and animal feed grinding.
3. Utilization of agricultural by products such as rice husk and straws, rice bran and Arhar Stalk.
4. Processing and Preservation of foods and seeds.
5. Biomethanation of agricultural and municipal wastes.

Practical

1. Determination of moisture content of grains.
2. Sieve analysis of ground materials.
3. Study of construction, operation, care and maintenance of different processing equipments.
4. Study of Biogas Plants.
5. Visits of place related to processing of farm produce.

Course-IV

Semester- VI **2+0=2**

FARMING SYSTEM AND SUSTAIBLE AGRAICLTURE CROP LANNING FARM MANAG AND SUSTANBALE AGRI (ICAR)

1. Farming systems- Definition, types and methods of farming.
2. Divination, scope and advantage of sustainable agriculture.
3. Modern agriculture in relation to sustainable agriculture.
4. Sustainable agriculture in relation to tillage fertilizers, irrigation, weed management and plant protection measures.
5. Important cropping systems for sustainable agriculture.

Course-V

Semester- VI **2+1=3**

AGRICULTURAL FINANCE, BUSINESS MANAGEMENT AND TRADE

A. Agricultural Finance

1. Credit, Meaning, Importance and credit control.
2. Definition, need for finance in agriculture, characteristics of good agriculture finance (credit)
3. Decision on the use of credit, Principles of farm credit (Equity or increasing Risk, Added Cost and Added Return, Cost of Credit and no loss no profit goal of farming and opportunity cost Principle)
4. Types of loans and classification of agricultural credit.
5. Qualifications of a borrower, Analysis and three R's and crdit (Return, Repayment Capacity and Risk-Bearing Capacity). Analysis of three G's of credit (character, capacity and capital).
6. Types of loan, according to liquidity, budgeted loan, loan amortization, Even payment method, Decreasing method.
7. Crop index reflecting use and farm finance.
8. Role and Rural Credit Institutions (Recommendations of the Banking Commission integrated Scheme of Rural Finance (Credit), Institutional Agencies, Taccan.
9. Sources of agricultural finance (Commercial banks, RRB, Lead Bank, Lead) Bank, NABARD, Cooperative Credit (PACs, Land Development Banks, National cooperative Federation, Farmers Service Cooperatives).

B. Business Management

1. Meaning of management, functions of management role of mangers and scope of management in agricultural business. Role and objectives in management references.
2. Decision making by individuals as also by groups.

3. Functional areas of management and their relationship with agriculture production, finance, marketing and human resources as coordination thereof.
4. Importance and nature of planning, useful generalization of planning forecasting technique with the help of a planning model, components of management, a technique for planning use of manager's owntime.
5. Leadership in Management, Types an Leadership for production, planning and control activities (inventory control quality control, cost control) and financial management, financial forecasting and planning acquisition of funds.
6. Acquaintance of book-keeping and cash accounts(s).

Knowledge of business environment for operation of bank account cheques, bank draft etc.

Course-VI

Semester- VI **2+1=3**

COMMUNICATION, DIFFUSION OF AGRICULTURE INNOVATION HISTORY AND DEVEL OF AGRI, RESEARCH AND DIFFUSION OF AGRI INNOVATION (ICAR)

Meaning and definition of communication. Communication process, elements and models of communication process. Types of communication. Key communicator Audio visual aids, their use and effectiveness.

Extension teaching methods- classification, merits and demerits, factors affecting selection and use of extension teaching methods,. Mass Media in Extension.

Meaning and definition of innovation, diffusion, adoption, diffusion effect and rate of adoption, stages of adoption, factors affection adoption, elements of difference between diffusion and communication. Innovation decision process, categories of adopters, characteristics of innovations.

Practical

1. Preparation, procurement and handling of aids.
2. Organizing group discussion, campaign, seminar, exhibition and demonstration.
3. Practices in writing news letter, circular letter, radio and television scripts on different farm practices.
4. Identification of farmers and their categories them in to different adopters categories.
5. Collection of information from farmers regarding different characteristics of innovations.
6. Collection of data regarding rate of adoption for the adoption of different farm practices in different years.

Course-VII

Semester- VI **0+1=1**

PLANT PATHOLOGY: MUSHROOM CULTIVATION MUSHROOM CULTURE AND LELEMENTARY PLANT NEMEOLOGY (ICAR)

Morphology of edible mushrooms and their classification. Swawn and its preparation. Methods of Cultivation of different types of edible mushrooms. Mushroom diseases and ests. Mushroom recipies.

Practical

(i) Practical record

(ii) Viva voce

Course-IV

Semester- VI **2+1=3**

ORNAMENTAL HORTICULTURE

Importance and scope of ornamental horticulture in India. Cultivation of annuals and canna. Commercial cultivation of rose, chrysanthemum, marigold and gladiolus; Making and maintenance of Lawn; Making and maintenance of Hadge and deging; Elementary Knowledge of common shrubs, climbers and trees and their various uses. Indoor gardening; Styles of gardens with special reference to Moghul and Japanese gradens: Flower arrangement and techniques to prolong vase life of flowers.

Practical

Identification of ornamental plants : Preparation of herbaceous border ; Practice of making garlands, Bouquet and arrangements in vases; Propagation of ornamental plants; Practice of potting and repotting of plants. Visit to ornamental gardens and research station.

B.Sc. Ag., SEMESTER-VII

Sl. No.	Department	Credit Hours	Title of the course
1.	Agriculture Extension	1+1=2	Rural agricultural work experience all departments related in field work
2	Agriculture Economic	1+1=2	
3	Agriculture Botany	0+1=1	
4	Agriculture Chemistry	0+1=1	
5	Agriculture Dairy	0+1=1	
6	Agriculture Engineering	0+1=1	
7	Agriculture Horticulture	0+1=1	
8	Agriculture Soil conservation	0+1=1	
9	Agriculture Agronomy	0+1=1	
10-	Agriculture Paint Pathology	0+1=1	
11	Agriculture Entomology	0+1=1	

Semester- VIII

RURAL AGRICULTURAL WORK EXPERIENCE

It is often complained that the agricultural graduates lack professional competence and cut a shy figure in facing farmers. Keeping this in view the rural agricultural work experience (RAWE) is included in the programme. Where students will be exposed to rural (Village) environment for strenghtening practical training group of students will be associated to farmers. Agro- industrial units and agricultural research station for this purpose for a period of 3-4 months they will be constantly supervised and evaluated by the faculty and a detailed report of the survey and works of the students for the period is to be submitted by him.

B.Sc. Ag., SEMESTER-VIII

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Rainfed Agriculture Dry land forming and water shed management (ICAR)
2	Soil conservation	2+1=3	Silviculture and agroforestry Agro forestry and special forestry (ICAR)
3	Horticulture	1+1=2	Production technology of medicinal aromiatic and spices crops Plant corps spices medicinal and aroma crops (ICAR)
4	Agriculture Soil Chemistry	2+1=3	Management of problems soils and water land
5	Animal husbandry and dairy	2+1=3	Dairy Chemistry and animal nutrition animal nutrition including fortage and grasses (ICAR)
6	Computer	1+1=2	Computer Applications

Semester- VIII **2+1=3**

RAINFED AGRICULTURE
DRY LAND FORMING AND WATER SHED MANAGEMENT (ICAR)

1. Definition, Characteristics and extent of rainfed/dry alnd farming areas in the country and the state of U.P.
2. Problems in dryland agriculture.
3. Moisture conservation practices and use of antitranspirants in dryland farming.
4. Watershed management concept, Principles and practices.
5. Selection of suitable crops, crop relations and crop mixtures for various categories of rainfed reas.

Practical

1. Preparation of crop rotations and cropping schemes for rainfed farming and dry land agriculture.
2. Determination of Soil Moisture constants.
3. Studies on moisture depletion pattern and rainfed farming.
4. Study of practical application of antitiranspirants.
5. Visit to Dry farming research stations.
6. Maintenance of practical record.

Semester- VIII **2+1=3**

SILVICLTURE AND AGROFORESTRY AGRO FORESTRY AND SPECIAL FORESTRY (ICAR)

(A) Silviculture:

1. Definition and scope of silviculture, Forestry, its scope and classification.
2. Role of forests- geographic, productive and bioaesthetical.
3. Elementary idea of forest types.
4. Regeneration of forests.
   (a) Natural seed production, seed dispersal, germination and seedling establishment.
   (b) Artificial Afforestation, reforestation and their objectives. Choice of tree species nursery techniques.

(B) Agroforestry

1. Definition, concept and need of agro forestry.
2. Classification of agro forestry systems.
3. Prominent agro forestry system prevailing in Uttar Pradesh.
4. Limitaions of agro forestry, choice of tree species for agro forestry for fuel, fodder and timber requirement.

Practical

1. Afforestation, techniques of problematic sites viz. ravines, saline-alkali soils, waterlogged areas, arid areas, hilly areas; roadside and canal bank plantation
2. Nursery techniques- Numerical problems.
3. Numerical problems on planting and cost of earthwork estimation.
4. Identification of forest tree species.

Semester- VIII **1+1=2**

PRODUCTION TECHNOLOGY OF MEDICINAL AROMIATIC AND SPICES CROPS PLANT CROPS SPICES MEDICINAL AND AROMA CROPS (ICAR)

1. Importance and scope of medicinal, aromatic and spices crops.
2. Cultivation of menthe, citronella, Khus, Ocimum, Rauvolifia and Dioscoria.
3. Cultivation of turmeric, Zinger, Coriander, Zira and Saunf in the North Indian Condition.

Practical

1. Identification of medicinal and aromatic plants.
2. Calculation of the cost of cultivation of menthe, citronella, Rauvolfia and Dioscorea.
3. Practical, Identification and demonstration of spices in the course.
4. Visit to commercial growing places and research stations of the medicinal, aromatic and spices crops.

Semester- VIII **1+1=2**

MANAGEMENT OF PROBLEM SOIL AND WATER LAND

Management of Problem soil

1. Saline and sodic soils- Occurrence classification, formation, diagnosis, characteristics and management.
2. Acid Soils- occurrence, formation, diagnosis, characteristics and management.
3. Waterlogged soils- occurrence, characteristics and management.
4. Eroded soils: Occurrence characteristics and management.

Management of Wasteland

5. Definition, classification, distribution and extent of wastelands in India with particular reference to U.P. and their Management.
6. Factors responsible for land degradation and characteristics of different types of wastelands.
7. Soil Management in Arid and Semiarid areas and sand dune Stabilization.

Practical

1. Determination of pH, EC, gypsum requirement, lime requirement in problem soil.
2. Determination of specific gravity, bulk density, pore space, soil texture.
3. Visit to Area of problem soil.

Semester- VIII **1+1=2**

DAIRY CHEMISTRY AND ANIMAL NUTRITION ANIMAL NUTRITION INCLUDING FORTAGE AND GRASSES (ICAR)

Unit-1 The milk and colostrums, secretion of milk, chemical composition and physio-chemical properties of milk and colostrums, chemical changes occurring during storage of milk, Preservation of milk. Adulteration of milk and its detection.

Unit-II Chemistry of milk constituents viz. lactose, fat protein, enzymes and vitamins.

Unit-III Classification of feeding stuffs, composition of Animal body and feeds, Functions of food constituents, the digestion and absorption of food constituents in ruminates

Unit-IV The metabolism of fat, carbohydrate and protein.

Unit-V Role of minerals, harmons, vitamins and Antibiotics in animals feeding with special reference to deficiency diseases.

Practical

1. Sampling of milk
2. Analysis of milk for TS, SNF, Fat, Total ash, Calcium and Phosphorus,
3. Determination of lactose in milk and proteins.
4. Analysis of feeds for total ash, CaO_1 P_2 O_5 and Proteins.
5. Demonstration of estimation of Ether Extract and crude fibre in feeds.

Course

Semester- VIII **1+1=2**

COMPUTER APPLICATION

Introduction to computer. A brief history of computing. Data Processing and information. Use. Definition, Anatomy, Components, Classification of computers. Capability and limitation of computer. Number systems. Decimal. Binary, octal, hexadecimal. Character codes. ASCH, EBCDIC, BCD. Computer organization-CPU, Input-output devices. Various types of memories. Introduction to DOS (Disk operating system). Fundamentals of DOS commands, Internal, External, Editor, Files and Directory, Elementary Idea of Basic (Computer Language).

Practical

Simple Programming Exercises in BASIC

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

Syllabus & Evaluation Scheme

B.Voc

Bachelor of Vocational Studies

(Bachelor of Vocation)

3-Year Undergraduate Course

Based on

AICTE MODEL CURRICULUM

(EFFECTIVE FROM THE SESSION: 2019-20

CONTENTS

Sr. No	Topic	Branch Code
1	Automotive Manufacturing Technology (AM)	101
2	Automobile Servicing (AS)	102
3	Production Technology (PT)	103
4	Industrial Tool Manufacturing (IM)	104
5	Refrigeration and Air Conditioning (RC)	105
6	Software Development (SD)	106
7	Graphics & Multimedia (GM)	107
8	Banking Finance Services and Insurance (FS)	108
9	Electronic Manufacturing Servicing (EM)	111
10	Medical Imaging Technology (MI)	112

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Automotive Manufacturing Technology (AM)
Branch code:101

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme
B. VocAutomotive Manufacturing Technology

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BAMV511	Motor Vehicle Technology –I		10	5	5	20	30		**50**	**2**
2	BAMV512	Automobile Electrical Equipment	30	10	5	5	20	30		**50**	**2**
3	BAMV513	Two and Three Wheeler	30	10	5	5	20	30		**50**	**2**
4	BAMV514	Modern Electric & Hybrid Vehicles	30	10	5	5	20	30		**50**	**2**
5	BAMP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BAMP512	Electric & Hybrid Vehicles Lab	30				20		30	**50**	**1**
7	BAMP513	Language Lab	30				20		30	**50**	**2**
8	BAMT 511	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BAMT 512	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAMT 513	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAMT 514	Tool Designer (ASC/Q4001)									
	BAMT 515	Equipment Designer L5 (ASC/Q 6405)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BAMV521	Total Quality Management	30	10	5	5	20	30		**50**	**2**
2	BAMV522	Motor Vehicle Technology –II	30	10	5	5	20	30		**50**	**2**
3	BAMV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BAMV524	Rapid Prototyping & Reverse Engineering	30	10	5	5	20	30		**50**	**2**
5	BAMP521	Project	30				20		30	**50**	**1**
6	BAMP522	Engineering Graphics	30				20		30	**50**	**1**
7	BAMP523	Mechanical Workshop Practice Lab	30				20		30	**50**	**2**
8	BAMT521	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BAMT522	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAMT523	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAMT524	Tool Designer (ASC/Q4001)									
	BAMT525	Equipment Designer L5 (ASC/Q 6405)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV631	Automobile Electrical System	30	10	5	5	20	30		50	2
2	BAMV632	Automobile Drawing & Design	30	10	5	5	20	30		50	2
3	BAMV633	Automobile Engines	30	10	5	5	20	30		50	2
4	BAMV634	Mass Production Devices	30	10	5	5	20	30		50	2
5	BAMH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BAMP631	Automobile Workshop - I	30				20		30	50	1
7	BAMP632	Tool & Die Making Lab.	30				20		30	50	1
8	BAMT631	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training 400 hrs/ 8 weeks			150	12
	BAMT632	Automation Specialist (ASC/Q6807)									
	BAMT633 BAMT634	Assembly Line Machine Setter (ASC/Q3603))									
		Process Design Engineer (ASC/Q6404)									
	BAMT635	Quality Controller (ASC/Q1605)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV641	Automobile Engine Systems	30	10	5	5	20	30		50	2
2	BAMV642	Automotive Refrigeration and Air Conditioning	30	10	5	5	20	30		50	2
3	BAMV643	Vehicle Performance and Testing	30	10	5	5	20	30		50	2
4	BAMV644	Electrical & Hybrid Vehicles – II	30	10	5	5	20	30		50	2
5	BAMH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BAMP641	Automotive RAC Lab	30				20		30	50	1
7	BAMP642	Vehicle Performance and Testing Lab	30				20		30	50	1
8	BAMT641	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			150	12
	BAMT642	Automation Specialist (ASC/Q6807)									
	BAMT643	Assembly Line Machine Setter (ASC/Q3603))									
	BAMT644	Process Design Engineer (ASC/Q6404)									
	BAMT645	Quality Controller (ASC/Q1605)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV751	Automotive System Design	30	10	5	5	20	30		50	2
2	BAMV752	Plant Layout & Product Handling	30	10	5	5	20	30		50	2
3	BAMV753	Industrial Engineering& Safety Engineering	30	10	5	5	20	30		50	2
4	BAMV754	CAD & CAM	30	10	5	5	20	30		50	2
5	BAMH751	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BAMP751	CAD&CAM Lab	30				20		30	50	1
7	BAMP752	Design of Automotive Systems Lab	30				20		30	50	1
8	BAMT751	Spare Parts Operations In charge (ASC/Q1503)					Any one Training 400 hrs/ 8 weeks			150	12
	BAMT752	Body Shop In-Charge (ASC/Q1413)									
	BAMT753	Service Supervisor (ASC/Q1412)									
	BAMT754	Testing Manager (ASC/Q8405)									
	BAMT755	Product Design Manager L7 (ASC/Q8103)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV761	Vehicle Safety	30	10	5	5	20	30		50	2
2	BAMV762	Agile & Lean Manufacturing Systems	30	10	5	5	20	30		50	2
3	BAMV763	Process Planning & Control	30	10	5	5	20	30		50	2
4	BAMP761	Major Project	180						150	150	6
5	BAMT761	Spare Parts Operations In charge (ASC/Q1503)				Any one Training (other than 5thsem) 400 hrs/ 8 weeks				200	12
	BAMT762	Body Shop In-Charge (ASC/Q1413)									
	BAMT763	Service Supervisor (ASC/Q1412)									
	BAMT764	Testing Manager (ASC/Q8405)									
	BAMT765	Product Design Manager L7 (ASC/Q8103)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Motor Vehicle Technology – 1

UNIT-I :
Introduction & Chassis Layout
General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle, their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

UNIT-II:
Clutch System
Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque transmitted by clutch, simple numerical problems. Clutch defects, probable causes, remedies.

UNIT-III:
Gear Box
Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheels drive auxiliary gear box. Gear ratio

UNIT-IV:
Final Drive
Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio. Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

UNIT-V:
Wheels and Tyres
Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyre pressure, Advantages of filling nitrogen in tyres.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology ,David R. Rogers, Peter Coombes, and Victor Albert Walter Hillier

Automobile Electrical Equipment

UNIT-I:

Automobile Wiring Systems & Cables

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems, Positive and negative earthing, Cables-starting systems cables, general purpose cables and high-tension cables; specifications and colour codes, Diagram of a typical wiring system, Wiring harness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits, Fuses in circuits.

UNIT-II:

Storage Battery

Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound, Electrolyte: specific gravity of electrolyte and its variation with temperature, Effect of charging and discharging of specific gravity, Capacity of battery, Efficiency of battery,Methods of charging of battery, Internal circuit of battery charger, Care and maintenance of batteries, Checking for cell voltage and specific gravity of electrolyte, Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test, Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery, Alkaline type batteries, Fuel cell and its types, Battery Life enhancer.

UNIT-III:

Dynamo

Principle of generation of D.C. Constructional details of a Dynamo, Armature reaction, Principle of commutation, Construction of commutator, Types of wound field generatorseries, shunt and compound wound. Other types of D.C. generators-four brush & four pole, interpole, split field and bucking field,Dyna-Starter, Generator drive.

UNIT-IV:

Alternator

Principle of generation of A.C. Constructional details of an alternator, Working of alternators, Advantages over dynamo, Types of alternators, Charging of battery with an alternator, Regulator for alternators.

UNIT V:

Regulators

Constant current and constant voltage systems, Double-contact and compensated voltage control regulators. Current-and-voltage regulator, Cut-out.

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge 4. Automotive Electrical Equipment: WH Crouse

Two and Three Wheeler

UNIT-I: The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

UNIT-II: Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system,Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System,Starting system - Kick starter system – Self-starter system, recent technologies

UNIT-III: Chassis and Sub-Systems

Main frame for two and three wheelers, its types, Chassis and different drive systems for twowheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear control sin two wheelers, Front and rear suspension systems, Shock absorbers, Panel meters and controls on handle bar, Freewheeling devices

UNIT-IV: Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links layouts.

Brake actuation mechanism,Spoked wheel, cast wheel, Disc wheel & its merits and demerits,Tyres and tubes Construction & its Types, Steering geometry

UNIT-V: Two & Three Wheelers – Case Study

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer, Servicing and maintenance, recent developments

Reference Books:

1 .Two and three wheeler technology, dhruv u. Panchal

Modern Electric and Hybrid Vehicles

UNIT-I: Introduction

Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics

UNIT-II: Electric and Hybrid Electric Drive Trains

Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages and disadvantages

UNIT-III: Power Flow

Power flow control in electric and hybrid electric drive train topologies.

UNIT-IV: Electric Drive Components

Introduction to electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.

UNIT-V: Regenerative Braking System (RBS)

Introduction and need of Regenerative Braking System, Advantages and disadvantages of RBS, Working of RBS, Concept of Regenerative Braking using Piezoelectric material, Using shock absorbers as vibration energy harvesters.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Automotive Fuel Technology-Electric, Hybrid and Fuel-Cell Vehicles: Jack Erjavec& Jeff Arias
3. Electric and Hybrid Vehicles: Design Fundamentals: Iqbal Husain
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design: Mehrdadehsani, Yimingao, AliEmadi.

Metrology and Measuring Instruments lab

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of autocollimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Electric and Hybrid Vehicles Lab

1. Understand working of different configurations of electric vehicles
2. Understand hybrid vehicle configuration and its components, performance analysis
3. Understand the properties of batteries and its types
4. Understand of electric vehicle drive systems.
5. Understand of hybrid electric vehicles.
6. Understand Auxiliary systems including charging, starter motor, on board power supply, lighting and environmental sensing and conducting repairs. Repair & Replacement of Electric/ Hybrid Vehicle body
7. Repair & Replacement of Electric Vehicle Drive Train
8. Fault diagnosis & repair / replacement of Battery, DC & AC Electrical Machines, and Hybrid Electric Vehicles.

Level 5 (Semester II)

Total Quality Management

1. Introduction, Basic concepts of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5–'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

Motor Vehicle Technology - II

UNIT-IFrame and Body

Function and construction of frame, Cross-section of frames, Unitized construction (monocoque) types of bodies, Terms - Turning radius, lock-to-lock angle, centre point steering, positive steering, gradeability, Idea of Safety features in a modern car.

UNIT-II: Suspension System

Function, Types - conventional and independent, Spring types - coil, leaf - elliptical, semielliptical; helper springs, transverse springs, Spring camber; spring material, Torsion bar, stabiliser bar, Shock absorbers- telescopic and gas,Maruti suspension system and shockers, Anti-roll bars, Nitrox suspension.

UNIT-III:Steering System and Front Axle

Principle - Ackermann and Davis, Function, requirements, Steering gear box – types, Construction and working details of worm and sector, rack and pinion, worm and wheel, worm and recalculating ball type, Tractor steering, Power steering, Electronic Steering, Front axle - rigid front axle, Stub axle, Elliot and reverse elliot type,Lemoine and reverse lemoine type, Tractor front axle, Maruti steering system, Wheel alignment - castor angle, camber angle, K.P.I., Toe-in, toe out, General values of these.

UNIT-IV: Braking System

Braking terms - braking efficiency, stopping distance, stopping time, weight transfer during braking, leading/trailing shoe of brake,Determination of braking torque, Effect of braking on steering, Types of braking systems- constructional details and working of mechanical brakes, hydraulic brakes, parking brake, vacuum, pneumatic, air-hydraulic brakes; tractor brakes, Drum and disc brakes, Master cylinder, tandem master cylinder, wheel cylinder, Brake lining and brake fluid, Brake defects, their causes and remedies,Anti-Lock Braking System (ABS) & Electronic Brake Distribution (EBD).

UNIT-V: Automobile Pollution and Its Control

Effects and extent of pollution caused due to stationary and automobile engines, Harmful products and their causes in petrol & diesel engines, Measures to control exhaust emissions from two-stroke engines, four-stroke engines, and diesel engines, Turbocharger, Products which cause de-activation of catalysts in catalytic converters, Unleaded petrol, Emission measuring instruments for petrol and diesel engines. Limits specified in Motor Vehicles Act. Recent trends in Automobile Pollution Control- Exhaust Gas Recirculation, Air Injection, Reactor System, Positive Crankcase Ventilation,and Evaporative Emission Control System.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House

Material Science & Materials

UNIT-I:General:
Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importanceTheir chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

Structure of Metals and their Deformation:
Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

UNIT-II:Metals-Ferrous Metals
1. Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications
(d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT-III:NON-METALIC MATERIALS
Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics
Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.
Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT-IV:Identification and Testing of Metal Alloys:
Selection, specification forms and availability of materials.

Heat Treatment of Metals:
Elementary concept, purpose, Iron-carbon equilibrium diagram T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:
1 .MATERIAL SCIENCE: RS Khurmi& RS Shedha
2.Materials Science and Engineering,WilliamCallister

Rapid Prototyping & Reverse Engineering

UNIT-I:Introduction:
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT-II:CAD Modelling and Data Processing for RP:
CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT-III:RP Systems:
Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes, Extrusion - Based RP Systems, 3D Printing process modeling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

UNIT-IV:Rapid Tooling:
Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

UNIT-V:RP Applications:
Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Reference Books:
1. Reverse Engineeringby Kiran J. Fernandes (Editor), Vinesh Raja (Editor)
2. Rapid Prototyping - Theory and Practice | Ali K. Kamrani | Springer

Project

On the basis of learning in the vocational diploma, a project to be taken up by the student strengthening his/ her vocational skills

Engineering Graphics

1. Introduction

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP.Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2. Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

3. Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of Tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut Spheres.

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same
2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra&Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (Semester I)

Automobile Electrical System

UNIT-I:STARTING SYSTEM

Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, typical motor specifications

UNIT-II:IGNITION SYSTEM OF SPARK-IGNITED ENGINES

Types of ignition systems- battery and coil, magneto ignition systems, Ignition circuit, Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive, Firing order, Ignition timing, Ignition advance and retard, need, and factors it depends upon, Methods for obtaining advance and retard vacuum and mechanical, Optical sensor for spark timing.

UNIT-III: Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs, Glow plugs of diesel engines, Magneto-rotating armature and rotating magnet types, Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

UNIT-IV: LIGHTING SYSTEM

Requirements of automobile lighting, Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly, Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners, Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs, Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp, Auxiliary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

UNIT-V:ACCESSORIES

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, ampere meter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly, Radio and television Interference suppressors, electrical switches. Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Automotive ElectricalEquipment,Kohli

Automobile Drawing & Design

UNIT-I: Drafting of sectional views of the following assemblies: (a) Cylinder block and crankcase of 2-wheeler, (b) Poppet valve assembly of a 4-stroke engine, (c) Piston assembly, (d) Connecting rod assembly, (e) Spark plug, (f) Injector.

UNIT-II: Free hand line diagram of the following systems: (a) Fuel system of petrol engine (b) Fuel system of diesel engine (c) Cooling system of a multi-cylinder engine (d) Lubricating system of a multi-cylinder engine (e) Steering system of Maruti (f) Suspension systems of Maruti (g) Hydraulic Braking System of Maruti Zen (h) Air Hydraulic Braking System of TATA (i) Block diagram of Electronic Fuel Injection (EFI) system (j) Block diagram of Common Rail Direct Injection (CRDI) system (k) Oxygen sensor (l) Fuel injector of EFI.

UNIT-III: Drafting of sectional views of the following assemblies (1) Master cylinder (2) Wheel cylinder (3) Universal joint

UNIT-IV: Sketch layouts of (a) Depot (b) F.I. pump reconditioning shop (c) Electrical Workshop.

UNIT-V: Design of the following components of an automobile engine (1) Piston assembly (2) Connecting rod assembly (3) Crank shaft (4) Flywheel

Reference Books:

1. Automobile Drawing: RB Gupta

Automobile Engines

UNIT-I:(A)Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat, Conservation of energy, First and Second Law of thermodynamics, P-V diagram, Reversible process, Various thermodynamic processes, Entropy, General case for change of entropy of a gas, Change of entropy during various processes,Temperature-entropy diagram, Simple numerical problem.

(B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle, Effect of compression ratio on efficiency, Simple numerical problem, Graphical representation of ideal and actual cycle, Comparison between actual and ideal cycles, Reasons for variation, Mean effective pressure, Work done during the cycle.

UNIT-II: (A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams, Classification of I.C. Engines. (B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, gaskets, Different cylinder arrangements. Cylinder wear, Forms of combustion chamber in petrol engine, Location of spark plug, Combustion chamber in Diesel engines, Turbulence in Combustion chambers.

UNIT-III:Engines Details (continued)(b) Piston-plain, split skirt, auto-thermic, cam-ground, Anodising and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism, Valve clearance, Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod, Bearing metal for big and small end of connecting rod (g) Crank shaft, Left hand, right hand crankshaft, Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding,. Main bearings Crankshaft end play. Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT**).**

UNIT-IV: Rotary Engine, Principle and operation, Engine cooling, Advantages and limitations. (B) Internal combustion Turbine, Principle of working, Classification, Brayton cycle, Cycle efficiency, Friction effect, Optimum compression ratio, Simple numerical problems, Deviation of practical cycles, Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials, Turbine blades.

UNIT-V: Supercharging and scavenging. Necessity of supercharging, Rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging, Methods and classification of scavenging process, Performance of different scavenging systems. (B) Engine specifications, specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Thermal Engineering I & II: Sarao, Gambhir& Aggarwal
3. Automobile Engineering II: Kirpal Singh
4. Basic Automobile Engineering: CP Nakra
5. Automobile Engineering: RB Gupta

Mass Production Devices

UNIT-I:Tool holders:
Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

UNIT-II:Locating and clamping devices:
Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

UNIT-III: Clamping devices:
Types, Sketches with nomenclature, Working, Applications

UNIT-IV:Jigs and fixtures:
Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures,

UNIT-V: Design of Jigs and Fixtures:
Steps in designing jigs and fixture for given simple component

Reference Books:

1. Mass Production, Products from Phaidon Design Classics
2. Mass-production management,design and operation of production flow-line systems Hardcover – 1972by Ray Wild (Author)

Automobile Workshop -I

UNIT-I: Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, WagonR, Swift (Petrol & Diesel); Hyundai: Santro, Ford: Figo; Volkswagen: Polo; Chevrolet: Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking

UNIT-II: Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerized wheel aligner

UNIT-III: Measurement of Exhaust Pollution by various analyzers such as Four Gas Analyser, Smoke meter, Noxanalyser

UNIT-IV: Use of Headlight aligner, Wheel aligner, automotive oscilloscope

UNIT-V: Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focusing and alignment of head lights

Reference Books:

1. Engine Service: Gary Lewis
2. Various Car's Manuals

Tool & Die Making Lab

1. Manufacture of Box Jig and Angle plate jig
2. Manufacture of "V" Block angle grinding Fixtures and profile milling fixture
3. Manufacture of simple Blanking & piercing Tool
4. Manufacture of Progressive tool for producing a Cycle chain link
5. Manufacture of Press tools like Combination tool & Compound tool
6. Manufacture of Draw tool
7. Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup, Washer and Cycle bell cup
8. Manufacture of simple V and U bending tool 9. Maintenance of Jig & fixture and press tool

Level 6 (Semester II)

Automobile Engine Systems

UNIT-I:STARTING SYSTEM: Idea of engine starting-system circuit, Kick-starting system of 2 wheelers,Starting of mopeds. IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and its working Compression ignition of diesel engines, LUBRICATION SYSTEM: Lubrication in 2 stroke engines - petrol and oil-injection. Lubrication in 4 stroke multi-cylinder petrol/diesel engines, Dry and wet sump lubrication, Full pressure and semi-pressure lubrication, Oil pump types, Oil pump drive, relief valve; pressure gauge. Oil filters, Full-flow and by-pass type filtering system, Crankcase dilution, crankcase ventilation,Positive Crankcase Ventilation, Properties and functions of a good lubricating oil, Additives, Gradation of lubricating oil due to viscosity, SAE numbers, Service rating, 2T and Super 2T oils for use in 2-s engines.

UNIT-II:COOLING SYSTEM: Necessity of cooling of I.C. engines, Methods of cooling-air cooling, water cooling, liquid cooling, Shape of cooling fins, Field of application of air cooling, Water cooling system - Thermo siphon system, pump system, thermostat system of cooling, Thermostat – types, Radiators-different types, their construction and function, Pressurized cooling system; radiator pressure-cap, surge tank, Cooling water temperature gauge, Antifreeze and anti-corrosive additive, Coolants, Flushing of cooling system.

AUTOMOBILE ENGINE FUELS: Types of fuels, Influence of structure, Calorific value, Requirements in fuels for I.C. engines, Properties, Fuel rating, Additives for S.I. and C.I. engine fuels, Specifications of petrol and diesel, Leaded and un-leaded petrol, Low Sulphur diesel, Enhancing Power output- Nitrox injection, Non-conventional fuels - LPG, CNG ethanol-mixed petrol, Properties, method of manufacture and their performance as I.C. engine fuels. Engine modifications required, Dual mode engine, Idea of Electric Vehicles and Hybrid Vehicles.

UNIT-III:FUEL SYSTEM OF DIESEL ENGINES: Fuel supply system,Filters (primary and secondary) positioning of filters, Feed pump, Solid and air injection system, Fuel injection pump, different types-plunger, distributor pump, their construction and working, Injectors, Governors, Types of governing, Combustion process in diesel engine, Diesel knock, Electronically Controlled Diesel Injection Pump, Common Rail Direct Injection, Piezoelectric effect and its use in CRDI.

UNIT-IV:FUEL SYSTEM OF PETROL ENGINES: Gravity feed system used in 2-wheelerS, Fuel supply circuit of 4-wheelers, Mechanical and electrical fuel pump, Electric fuel gauge, Petrol fuel filter, Air/fuel ratio, Variation of air/fuel ratio with speed, Air cleaners (wet & dry), Cyclone filter, CARBURETOR - Function and principle of working of simple carburetor, Carburetor controls- throttle, choke, Types of Carburetors- fixed jet carburetor (Solex type) and constant vacuum carburetors used in YAMAHA motorcycle, Twin-barrel carburetors, Classification of carburetors, Disadvantages of carburetors, Phenomenon of combustion and detonation, Pre-ignition.

UNIT-V:FUEL INJECTION SYSTEMS (PETROL ENGINE): TBI, MPI, the Electronic Module,and Advantages of Electronic Fuel Injection (EFI), Block diagram of the EFI, The Air Intake System and the Idle Air Control System. Fuel Delivery System, Various sensors used with the ECM, their location and purpose, Fuel Injector, Idea of Gasoline Direct Injection ENGINE PERFORMANCE AND TESTING: Various losses in an engine, Heat balance, Morse method of finding IHP, Calculation of various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, specific fuel consumption. Performance curves.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House

Automotive Refrigeration & Air-conditioning

UNIT-I:Refrigeration Fundamentals:

Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air conditioning.

UNIT-II:Refrigerants and Air conditioning Components:

Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination

UNIT-III:Air distribution system:

Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance

Psychrometry: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.

UNIT-IV: Load analysis and control devices:

Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and actuators.

UNIT-V: Diagnostics, Trouble Shooting, Service and Repair:

Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass, Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting, Removing and replacing components, Compressor service.

Reference Books:

1. Refrigeration & Air Conditioning, Sadhu Singh, Khanna Publishing House

Vehicle Performance & Testing UNIT-I:

Vehicle Performance Parameters:

Vehicle Performance parameters: Fuel economy, acceleration, deceleration, grad ability, top speed, handling, comfort, life durability, EGR systems, Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function and construction, Lambda close loop control system for gasoline vehicles.

UNIT-II:Drive train and Component testing:

Vehicular transmission performance: comparison of automotive clutches,Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.

UNIT-III:Vehicle testing:

Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle. Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water Laboratory testing: Testing on chassis dynamometer, transition testing (Euro III onwards), accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test. Collisions and Crash Testing: Crash testing: Human testing, dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.

UNIT-IV:Comfort, Convenience and Safety:

Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system, Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.

UNIT-V: Noise Vibration and EMI:

Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement. Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.

Reference Books:

1. Road Vehicle Performance: Methods of Measurement and Calculation, George Gordon Lucas
2.The Engineering Principles of Vehicle Performance Testing,FrontCover,Fredrick James Furrer

Electrical & Hybrid Vehicles – II

UNIT-I:Hybrid Architecture and Power

Plant Specifications:
Series configuration locomotive drives- series parallel switching- load tracking architecture, Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT) wheel motors, Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.

UNIT-II:Sizing the Drive System and Energy Storage Technology:
Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters

UNIT-III:Fuel Cells:
Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra-capacitors- PEM fuel cell vehicles.

UNIT-IV:Energy Storage:
Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel-Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.

UNIT-V:Nonelectric Hybrid Systems:
Short term storage systems flywheel accumulators, continuously variable transmissions hydraulic accumulator's hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Electric and Hybrid Vehicles, Tom Denton

Automotive RAC Lab

1. Test on vapor compression test rig.
2. Test on air conditioning test rig.
3. Study of various methods of transport refrigeration systems.
4. Study and demonstration on car and bus air conditioning system.
5. Study of latest trends in automotive refrigeration systems.
6. Study and demonstration of controls in refrigeration.
7. Study of different components with the help of cut sections/models/charts- Compressor, Condenser, Evaporators, Expansion device, Blower fans, Hating systems etc.
8. Study of installation/operations/maintenance practices for refrigeration systems.
9. Study of leak testing and leak detection methods.
10. Visit to maintenance shop of automotive air conditioning and writing report on it.

Vehicle Performance & Testing Lab

1. Estimation of power requirement for vehicle propulsion by taking actual vehicle example.
2. Perform coast down test to find vehicle inertia.
3. On road fuel consumption test at different speeds.
4. Brake efficiency measurement
5. Pass- by noise test.
6. Free acceleration test.
7. Vibration measurement in passenger compartment
8. Laboratory testing of vehicle on chassis dynamometer for performance
9. Laboratory testing of vehicle on chassis dynamometer for emission.
10. Report based on visit to vehicle testing and research organization.
11. On road emission testing of petrol and diesel vehicles for PUC/RTO

Level 7 (Semester I)

Automotive System Design

UNIT-I: Design of Clutches & Gearbox:
Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, mutilate clutch and centrifugal clutch. Selection of gear ratios and final drive ratio, numerical on 3- speed and 4- speed gearbox.

UNIT-II: Design of Propeller Shafts and Axles:
Design of propeller shafts for bending, torsion and rigidity, Design of universal joints and slip joints, final drive, Design of live and dead axles.

UNIT-III: Brake Systems:
Design of hydraulic braking system, internal expanding shoe brake and disc brake, design of master and wheel cylinder and piping design.

UNIT-IV: Design of Suspension and Steering System:
General design considerations of suspension system, design of helical and leaf springs for automobile suspension system, design considerations of Belleville springs, elastomeric springs, design considerations of steering system and vehicle frame design.

UNIT-V: Statistical Consideration in Design and Optimization:
Ergonomics and aesthetic design, statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability, introduction to design optimization of mechanical elements, adequate and optimum design, methods of optimization, Johnson's method of optimum design-simple problems in optimum design like axially loaded members.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Plant Layout & Product Handling

UNIT-IObjective of Facility Design: Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

UNIT-IIComputerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.;

UNIT-IIIProduct handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, fork lifters;

UNIT-VI Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

UNIT-V

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

Reference Books:

1. Plant Layout and Materials Handling, R. B. Choudhary, G. R. N. Tagore
2. Plant Layout And Material Handling (Paperback, G.K. Agarwal)

Industrial Engineering & Safety Engineering

UNIT-I:INSPECTION: Inspection and its objective, Types of inspection, Inspection standards, Duties of inspection foreman, QUALITY CONTROL: Concept of quality control, elements of quality control, quality control groups, objectives of quality control, Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes, Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling. (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S (v) TQM system, concept & brief idea only

UNIT-II:WORK STUDY: Method study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, gang process chart, Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion Study. Principles of human motion economy, Micro-motion study, Memo motion study, Therbligs, left hand and right hand chart.

UNIT-III:CPM & PERT: Introduction to CPM, language of CPM net work. Diagram map for CPM chart, arrow diagram method of CPM, Programme Evaluation & Review Technique (PERT) Activity event net work (simple manual cases only), Project scheduling with CPM & PERT.

UNIT-IV:PLANT LAYOUT: General plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout, Advantages and disadvantages of process layout and product layout. GENERAL: Standardization, sources of standard, value of standardization, Production Planning & Control-Introduction, concept of planning, scheduling routing &dispatching and follow up functions. Need for Production, Planning and Control.

UNIT-V:MATERIAL HANDLING: Material Handling & material handling equipment, factors in material handling problems, cost reduction through improved material handling, Reduction in time of material handling, Material handling equipment-Idea about lifting lowering devices, Transportation devices, combination devices, Maintenance of material handling equipment.

INDUSTRIAL SAFETY: Need for safety-Legal, humanitarian, economic and social considerations. Safe working conditions and productivity, Unsafe conditions and hazards, Safety Engineering-General safety devices used on machines, Manual handling and storage of material, Mechanical handling of materials. Value Engineering, Meaning of Value, Value Analysis, reasons for unnecessary costs, selection of a product for value engineering, Data collection and analysis, TEN Commandments of Value Engineering, Brief idea of J.I.T. manufacturing and Kanban System.

Reference Books:

1. Industrial Safety, S.C. Sharma, Khanna Publishing House
2. Industrial Engineering Safety and Pollution ,Sanjai Kumar Gupta

CAD & CAM

UNIT-I:Introduction CIM and CAD & Analysis:
CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

UNIT-II:Computer aided Manufacturing CAM:
Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP : Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

UNIT-III: CNC Machine and Components:
CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

UNIT-IV:Part Programming:
NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

UNIT-V:FMS, Integrated Material Handling and Robot:
Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS).ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:
1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House
2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab & CAM Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.
10. To prepare part programming for plain turning operation.
11. To prepare part programming for turning operation in absolute mode.
12. To prepare part program in inch mode for plain turning operation.
13. To prepare part program for taper turning operation.
14. To prepare part program for turning operations using turning cycle.
15. To prepare part program for threading operation.
16. To prepare part program for slot milling operation.
17. To prepare part program for gear cutting operation.
18. To prepare part program for gear cutting using mill cycle.
19. To prepare part program for drilling operation

Design of Automotive Systems Lab

1. Design of automotive clutch assembly and component drawing using any drafting software (Two full imperial sheets along with design calculations report) consists of:
    - Functional design of clutch
    - Design of clutch shaft, hub and flange
    - Design of damper springs
    - Design of sectors, rivets etc.
    - Design of pressure plate assembly
    - Design for linkage mechanism
    - Details and assembly drawing
    - Details and assembly drawing
2. Design of automotive gear box along with reverse gear (Two full imperial sheets along with design calculations report) consists of:
    - Calculation of gear ratios
    - Determination of number of teeth on gear pair
    - Determination of gear reductions
    - Design of gear pairs
    - Design of shafts
    - Selection of bearings
    - Details and assembly drawing

3. Design of suspension spring and its analysis using any analysis software.

Level 7 (Semester II)

Vehicle Safety

UNIT-I: Introduction to vehicle safety, Basic concepts of vehicle safety, Risk evaluation and communication Human error control, Universal design, The distracted driver, Crash Testing

UNIT-II: Accident Data, Biomechanics and Occupant Simulation, Vehicle Body Testing, Dynamic Vehicle Simulation Tests, Occupant Protection, Pedestrian Protection, Compatibility, Interrelationship Among Occupants, Restraint Systems and Vehicle in Accidents, Significance of Rear Crash Safety, Role of seat in Rear crash safety, Performance criteria for different seats, Ultra high Retention seats

UNIT-III: Introduction to Accident Analysis Reconstruction methods, Uncertainty in Measurement and cautions Tire forces, Straight-line Motion, Critical speed from Tire Yaw marks, Reconstruction of Vehicular Rollover Accidents, Analysis of Collisions, Reconstruction Applications, Impulse Momentum Theory Crush Energy, Frontal Vehicle –Pedestrian Collision, Photogrammetry for accident constructions

UNIT-IV: Antilock braking system, Traction control system, Electronic Stability Program, Low tire pressure warning system, Collision avoidance systems

UNIT-V: Automotive Industry Standards, Transport Engineering Standards, Indian road congress Standards

Reference Books:

1. Automotive Vehicle Safety, Book by Barbara J. Peters and George A. Peters
2. Vehicle Safety Communications Book by Luca Delgrossi and Tao Zhang

Agile and Lean Manufacturing

UNIT-I:Introduction
Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

UNIT-II: Waste Identification
Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

UNIT-III:Value stream mapping
Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

UNIT-IV:Lean manufacturing tools
Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

UNIT-V:Agile manufacturing
Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:
1. Lean and Agile Manufacturing, Devadasan S.R
2. Agile and Lean Program Management, Johanna Rothman

Process Planning and Control

UNIT-I: Introduction, components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Selection of forecasting technique.

UNIT-II:Capacity Planning-
Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.

UNIT-III:Facility Location-
Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, Fixed position, combination and cellular layouts; Designing product and process layout, line balancing.

UNIT-IV:Production Control-
Capacity control and priority control, production control functions; Routing, scheduling, dispatching, expediting and follow up, Techniques of production control in job shop production, batch production and mass production systems

UNIT-V:Sequencing-
Priority rules, sequencing methods, sequence jobs through two work centers, scheduling services, application of CPM and PERT techniques.

Reference Books:
1.Process of Planning and Control, ChakrapaniSrinivasa

Project

On the basis of learning in the Bachelor of Vocational, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Automobile Servicing(AS)
Branch Code:102

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Automobile Servicing

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BASV511	Motor Vehicle Technology -I	30	10	5	5	20	30		**50**	**2**
2	BASV512	Manufacturing Technology	30	10	5	5	20	30		**50**	**2**
3	BASV513	Automobile Electrical Equipment	30	10	5	5	20	30		**50**	**2**
4	BASV514	Two and Three Wheeler	30	10	5	5	20	30		**50**	**2**
5	BASP511	Mechanical Workshop Practice lab	30				20		30	**50**	**1**
6	BASP512	Basic Electricity and Electronics lab	30				20		30	**50**	**1**
7	BASP513	Language Lab	30				20		30	**50**	**2**
8	BAST511	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BAST512	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAST513	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAST514	Equipment Designer L5 (ASC/Q 6405)									
	BAST515	Tool Designer (ASC/Q4001)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BASV521	Modern Electric & Hybrid Vehicles	30	10	5	5	20	30		**50**	**2**
2	BASV522	Motor Vehicle Technology -II	30	10	5	5	20	30		**50**	**2**
3	BASV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BASV524	Garage Organization & Transport Management	30	10	5	5	20	30		**50**	**2**
5	BASV525	Project	30				20		30	**50**	**1**
6	BASP521	Electric & Hybrid Vehicles Lab	30				20		30	**50**	**1**
7	BASP522	IT Tool Lab	30				20		30	**50**	**2**
8	BASP523	Equipment Designer L5 (ASC/Q 6405)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BAST521	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAST522	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAST523	Automotive Service Technician Level 5 (ASC/Q 1403)									
	BAST524	Tool Designer (ASC/Q4001)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV631	Automobile Electrical System	30	10	5	5	20	30		50	2
2	BASV632	Automobile Drawing & Design	30	10	5	5	20	30		50	2
3	BASV633	Automobile Engine Systems	30	10	5	5	20	30		50	2
4	BASV634	Auto Body Repair, Denting & Painting	30	10	5	5	20	30		50	2
5	BASH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BASP631	Automobile Workshop - I	30				20		30	50	1
7	BASP632	Auto Body Repair, Denting & Painting Workshop	30				20		30	50	1
8	BAST631	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training 400 hrs/ 8 weeks			150	12
	BAST632	Automation Specialist (ASC/Q6807)									
	BAST633	Assembly Line Machine Setter (ASC/Q3603)									
	BAST634	Process Design Engineer (ASC/Q6404)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV641	Automobile Engine Systems	30	10	5	5	20	30		50	2
2	BASV642	Automotive Refrigeration and Air Conditioning	30	10	5	5	20	30		50	2
3	BASV643	Vehicle Performance and Testing	30	10	5	5	20	30		50	2
4	BASV644	Electric and Hybrid Vehicles-II	30	10	5	5	20	30		50	2
5	BASH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BASP641	Automotive RAC Lab	30				20		30	50	1
7	BASP642	Vehicle Performance and Testing Lab	30				20		30	50	1
8	BAST641	Quality Controller (ASC/Q1605)					Any one Training (other than 3rd sem) 400 hrs/ 8 weeks			150	12
	BAST642	Automation Specialist (ASC/Q6807)									
	BAST643	Assembly Line Machine Setter (ASC/Q3603)									
	BAST644	Process Design Engineer (ASC/Q6404)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV751	Automotive System Design	30	10	5	5	20	30		50	2
2	BASV752	Alternative Fuel & Emission Control	30	10	5	5	20	30		50	2
3	BASV753	Automobile Maintenance Service &Repairs -I	30	10	5	5	20	30		50	2
4	BASV754	Auto NVH	30	10	5	5	20	30		50	2
5	BASH755	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BASP751	Automobile Workshop - II	30				20		30	50	1
7	BASP752	Design of Automotive Systems Lab	30				20		30	50	1
8	BAST751	Spare Parts Operations In charge (ASC/Q1503)					Any one Training 400 hrs/ 8 weeks			150	12
	BAST752	Body Shop In-Charge (ASC/Q1413)									
	BAST753	Service Supervisor (ASC/Q1412)									
	BAST754	Testing Manager (ASC/Q8405)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV761	Automobile Maintenance Service & Repairs - II	30	10	5	5	20	30		50	2
2	BASV762	Off-road Vehicles	30	10	5	5	20	30		50	2
3	BASH763	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BASP761	Automobile Workshop - I	180						150	150	6
5	BAST761	Product Design Manager L7 (ASC/Q8103)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BAST762	Body Shop In-Charge (ASC/Q1413)									
	BAST763	Service Supervisor (ASC/Q1412)									
	BAST764	Testing Manager (ASC/Q8405)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Motor Vehicle Technology – 1

Unit1: Introduction & Chassis Layout

General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle, their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

Unit2: Clutch System

Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque transmitted by clutch. Simple numerical problems. Clutch defects, probable causes, remedies.

Unit3: Gear Box

Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheel drive auxiliary gear box. Gear ratio

Unit4: Final Drive

Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio. Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

Unit5: Wheels and Tyres

Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyre pressure, Advantages of filling nitrogen in tyres.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology.A.W Hillier

Manufacturing Technology

UNIT1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Riveting, Elementary idea of machines used for the above processes.

UNIT2

WELDING:
(a) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.
(b) Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding and Gas welding (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG) (vi) Tungsten Inert Gas welding (TIG)

WELDING OF SPECIAL MATERIALS: (a) Welding of carbon steel, Low alloy steel and stainless steel, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron (c) Welding of Aluminium (d) Welding of Plastics.

UNIT 3

Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools-Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools
PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.
Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

UNIT4
Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects
MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces,

their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

FOUNDRY PRACTICE: Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

UNIT5

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods-Tensile Test, Hardness Test, Fracture Test, Impact Test (b) Non destructive methods-visual, Liquid Penetrant Testing, Magnetic particles Testing, Radiographic Testing.

Advance Welding Process: Plasma Arc Welding, Laser Beam Welding, Electron Beam welding, Atomic Hydrogen arc welding, Stud welding, Explosion welding.

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi

2. Production Technology, Vol. I: Hazra&Chaudhry

Automobile Electrical Equipment

Unit 1: Automobile Wiring Systems & Cables

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems Positive and negative earthing. Cables-starting systems cables, general purpose cables and hightension cables; specifications and colour codes. Diagram of a typical wiring systemWiring harness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits Fuses in circuits.

Unit 2: Storage Battery

Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound. Electrolyte: specific gravity of electrolyte and its variation with temperature. Effect of charging and discharging of specific gravity, Capacity of battery Efficiency of battery, Methods of charging of battery, Internal circuit of battery charger, Care and maintenance of batteries, Checking for cell voltage and specific gravity of electrolyte, Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test, Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery, Alkaline type batteries, Fuel cell and its types, Battery Life enhancer.

UNIT 3: Dynamo

Principle of generation of D.C. Constructional details of a Dynamo, Armature reaction, Principle of commutation, Construction of commutator. Types of wound field generator series, shunt and compound wound, Other types of D.C. generators-four brush & four pole, interlope, split field and bucking field, Dyna-Starter, Generator drive.

UNIT 4: Alternator

Principle of generation of A.C. Constructional details of an alternator, Working of alternators Advantages over dynamo, Types of alternators, Charging of battery with an alternator, Regulator for alternators.

UNIT 5: Regulators

Constant current and constant voltage systems, Double-contact and compensated voltage control regulators. Current-and-voltage regulator, Cut-out

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge
4. Automotive Electrical Equipment: WH Crouse

Two and Three Wheeler

Unit I: The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

Unit II: Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, and starting system - Kick starter system – Self starter system, recent technologies

Unit III: Chassis and Sub-Systems

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems, Shock absorbers, Panel meters and controls on handle bar, Freewheeling devices

Unit IV: Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links layouts. Brake actuation mechanism. Spoked wheel, cast wheel, Disc wheel & its merits and demerits. Tyres and tubes Construction & its Types. Steering geometry

Unit V: Two & Three Wheelers – Case Study

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer, Servicing and maintenance, recent developments.

Reference Books:

Two and three wheeler technology, dhruv u. Panchal

Mechanical Workshop Practice Lab

1. SHEET METAL WORKING AND SOLDERING:

(EX-1) Cutting, shearing and bending of sheet.
(EX-2) To prepare a soap case by the metal sheet
(EX-3) To make a funnel with thin sheet and to solder the seam of the same
(EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:

(EX-1) Hack sawing and chipping of M.S. flat
(EX-2) Filing and squaring of chipped M.S. job
(EX-3) Filing on square of rectangular M.S. Plate

3. SMITHY SHOP WORK:

(EX-1) To prepare square angular piece by M.S. rod
(EX-2) To Braze M.S. flat/Tipped tool on M.S. shank
(EX-3) To make a screw driver with metallic handle

4. Tin Smithy, Soldering, Brazing

(EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
(EX-2) Utility article-waste paper basket or paper tray
(EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:

(EX-1) Welding practice gas & electric
(EX-2) Welding for lap joint after preparing the edge
(EX-3) Welding Butt joint after preparing the edge
(EX-4) Gas Cutting
(EX-5)'T' joint welding after preparation of edge.

6. Measurement of angle with the help of sin bar /Vernier Bevel protractor
7. To measure the pitch, angle and form of thread of screw.
8. To measure length, breadth, Thickness and depth height with micrometer height gauge and Vernier Calipers.
9. Calibration of Vernier Calipers/micrometersHeight gauge/depth gauge.
10. Use of feeler, wire radius and fillet gauge measurement of standard parameters.

Reference Books:

1. Workshop Technology, Vol. I: Hazra&Chaudhry
2. Elements of workshop Technology Vol. I: BS Raghuwanshi

Basic Electricity & Electronics - Lab

1. Study of series resistive circuits.
2. Study of parallel resistive circuits.
3. Study of series and parallel connection of cells in circuits.
4. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
5. Charging and Discharging of a capacitor.
6. Verification of magnetic field of solenoid with Iron core and Air core.
7. Verification of Torque development in a current carrying coil in magnetic field.
8. Study of R.L.C. series circuit and measurement of power and power factor.
9. Study of current and voltage measurement using Ammeter and Voltmeter.
10. Study of current and voltage measurement using Galvanometer.
11. Study of current, voltage and resistance measurement using of Multi-meter
12. Study of Power and Energy measurement using Wattmeter and Energy meter.
13. Study of working of single layer PCB manufacturing.
14. Study of working of double layer PCB manufacturing.
15. Study and interpreting circuit diagram and to check the continuity of connections.

Instrument Required:

1. Trainer kit for measuring TCR
2. Lead acid battery
3. Hydrometer
4. Trainer kit for measuring power and power factor in RLC circuits
5. Ammeter
6. Voltmeter
7. Multi-meter
8. Galvanometer
9. Energy Meter
10. PCB Manufacturing Facility

Level 5 (Semester II)
Modern Electric and Hybrid Vehicles

Unit 1:

Introduction
Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics

Unit 2:

Electric and Hybrid Electric Drive Trains
Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages and disadvantages

Unit 3:

Power Flow
Power flow control in electric and hybrid electric drive train topologies.

Unit4:

Electric Drive Components
Introduction to electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.

Unit 5:

Regenerative Braking System (RBS)
Introduction and need of Regenerative Braking System, Advantages and disadvantages of RBS, Working of RBS, Concept of Regenerative Braking using Piezoelectric material, Using shock absorbers as vibration energy harvesters.

Reference Books:
1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Automotive Fuel Technology-Electric, Hybrid and Fuel-Cell Vehicles: Jack Erjavec& Jeff Arias
3. Electric and Hybrid Vehicles: Design Fundamentals: Iqbal Husain
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design: Mehrdadehsani, Yimingao, AliEmadi

Motor Vehicle Technology - II

Unit 1:

Frame and Body

Function and construction of frame, Cross-section of frames, Unitized construction (monocoque) types of bodies, Terms - Turning radius, lock-to-lock angle, centre point steering, positive steering, grade ability, Idea of Safety features in a modern car.

Unit 2:

Suspension System

Function, Types - conventional and independent, Spring types - coil, leaf - elliptical, semielliptical; helper springs, transverse springs, Spring camber; spring material, Torsion bar, stabiliser bar, Shock absorbers- telescopic and gas, Maruti suspension system and shockers.Anti-roll bars, Nitrox suspension.

Unit 3:

Steering System And Front Axle

Principle - Ackermann and Davis, Function, requirements, Steering gear box – types, Construction and working details of worm and sector, rack and pinion, worm and wheel, worm and recirculating ball type.Tractor steering, Power steering, Electronic Steering, Front axle - rigid front axle, Stub axle, Elliot and reverse elliot type, Lemoine and reverse lemoine type, Tractor front axle, Maruti steering system.Wheel alignment - castor angle, camber angle, K.P.I., Toe-in, toe out.General values ofthese.

Unit 4:

Braking System

Braking terms - braking efficiency, stopping distance, stopping time, weight transfer during braking, leading/trailing shoe of brake.Determination of braking torque, Effect of braking on steering, Types of braking systems- constructional details and working of mechanical brakes, hydraulic brakes, parking brake, vacuum, pneumatic, air-hydraulic brakes; tractor brakes, Drum and disc brakes, Master cylinder, tandem master cylinder, wheel cylinder, Brake lining and brake fluid, Brake defects, their causes and remedies, Anti Lock Braking System (ABS) & Electronic Brake Distribution (EBD).

Unit 5:

Automobile Pollution And Its Control

Effects and extent of pollution caused due to stationary and automobile engines, Harmful products and their causes in petrol & diesel engines, Measures to control exhaust emissions from two-stroke engines, four-stroke engines, and diesel engines, Turbocharger, Products which cause de-activation of catalysts in catalytic converters, Unleaded petrol, Emission measuring instruments for petrol and diesel engines. Limits specified in Motor Vehicles Act. Recent trends in Automobile Pollution Control-Exhaust Gas Recirculation, Air Injection, Reactor System, Positive Crankcase Ventilation, Evaporative Emission Control System.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology.A.W Hillier

Material Science & Materials

Unit 1 General:

Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importance, Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

Structure of Metals and their Deformation:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

Unit 2

Metals-Ferrous Metals

(a) Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications

(d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT 3:

NON-METALIC MATERIALS

Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT 4

Identification and Testing of Metal Alloys:

Selection, specification forms and availability of materials.

Heat Treatment of Metals:

Elementary concept, purpose, Iron-carbon equilibrium diagram, T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:

1. MATERIAL SCIENCE: RS Khurmi& RS Shedha
2. Material Science and engineering V Raghavan

Garage Organization & Transport Management

Unit 1:

Layout of garage and tools & equipment required

Location of modern automobile garage, Layout of a fully equipped modern garage, Major equipment used in repair, testing, and reconditioning of automobiles, Service Station equipment (compressor, washer, hydraulic ramp and other lifting devices etc.)Denting and painting tools and equipment, Layout of fuel filling station-cum-service station.Workshop safety.

Unit 2:

Garage Procedure

A typical garage organisation chart, Duties of garage foreman, Vehicle selling- dealership, showroom, Terms of Warranty, after-sales service, advertising, and salesmanship. Diagnosing and estimating repairs. Booking of repairs, Job card, time card, Inspection and testing of repaired vehicles, Billing of repairs, Customer record, Purchase and sale of used vehicles, Insurance and accidental jobs.Safety in garages.Customersatisfaction.Time management.

Unit 3:

Store Organisation

Stores and store-keeping procedure.Day book, ledger, stock register.Indenting and issue of spares and materials.Inventorycontrol.Stocking of material - shelves, racks, bins; fuels and inflammable materials.Handling of liquids and acids.Duties and responsibilities of storekeeper and purchase officer.Tools-Storing and issuing.

Unit 4:

Fleet Management

Types of vehicles in a fleet - goods vehicles, tankers and carriers, delivery vans, fire fighting vehicles, break-down service vehicles, buses and luxury vehicles. Layout of a fleet maintenance depot, Duties of driver, conductor and mechanic, Scheduling the maintenance of a fleet. Estimating the operating cost of transport vehicles

Unit 5:

Motor Vehicle Act

Definition of vehicles, testing and certifying procedures, Registration of vehicles, Permits for passenger and goods vehicles, Licensing, Transfer of ownership. Essentials of driving and traffic regulations; signals and traffic signs

Reference Books:

1. Fleet Maintenance & Management: AW Clair
2. Motor Vehicle Act and Transport Management V.S.Khilery

Project

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Electric and Hybrid Vehicles Lab

1. Understand working of different configurations of electric vehicles
2. Understand hybrid vehicle configuration and its components, performance analysis
3. Understand the properties of batteries and its types
4. Understand of electric vehicle drive systems.
5. Understand of hybrid electric vehicles.
6. Understand Auxiliary systems including charging, starter motor, on board power supply, lighting and environmental sensing and conducting repairs. Repair & Replacement of Electric/ Hybrid Vehicle body
7. Repair & Replacement of Electric Vehicle Drive Train 8. Fault diagnosis & repair / replacement of Battery, DC & AC Electrical Machines, Hybrid Electric Vehicles.

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 6 (SEMESTER- III)

Automobile Electrical System

UNIT 1:

Starting System

Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, typical motor specifications

UNIT 2:

Ignition System Of Spark-Ignited Engines

Types of ignition systems- battery-and-coil, magneto ignition systems, Ignition circuit, Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive. Firing order, Ignition timing. Ignition advance and retard, need, and factors it depends upon, Methods for obtaining advance and retard-vacuum and mechanical, Optical sensor for spark timing.

UNIT 3

Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs, Glow plugs of diesel engines.Magneto-rotating armature and rotating magnet types, Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

UNIT 4:

Lighting System

Requirements of automobile lighting, Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly, Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners.Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs.Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp. Auxillary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

UNIT 5:

Accessories

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, amperemeter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly, Radio and television Interference suppressors, electrical switches. Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge
4. Automotive Electrical Equipment: WH Crouse

Automobile Drawing & Design

Unit 1

Drafting of sectional views of the following assemblies: (a) Cylinder block and crankcase of 2-wheeler, (b) Poppet valve assembly of a 4-stroke engine, (c) Piston assembly, (d) Connecting rod assembly, (e) Spark plug, (f) Injector.

Unit 2

Free hand line diagram of the following systems: (a) Fuel system of petrol engine (b) Fuel system of diesel engine (c) Cooling system of a multi-cylinder engine (d) Lubricating system of a multi-cylinder engine (e) Steering system of Maruti (f) Suspension systems of Maruti (g) Hydraulic Braking System of Maruti Zen (h) Air Hydraulic Braking System of TATA (i) Block diagram of Electronic Fuel Injection (EFI) system (j) Block diagram of Common Rail Direct Injection (CRDI) system (k) Oxygen sensor (l) Fuel injector of EFI.

Unit 3

Drafting of sectional views of the following assemblies

(1) Master cylinder (2) Wheel cylinder (3) Universal joint

Unit 4

Sketch layouts of (a) Depot (b) F.I. pump reconditioning shop (c) Electrical Workshop.

Unit 5

Design of the following components of an automobile engine

(1) Piston assembly (2) Connecting rod assembly (3) Crank shaft (4) Flywheel

Reference Books:

Automobile Drawing: RB Gupta

Automobile Engine System

UNIT1

(A) Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat, Conservation of energy. First and Second Law of thermodynamics P-V diagram Reversible process Various thermodynamic processes, Entropy, General case for change of entropy of a gas. Change of entropy during various processes, Temperature-entropy diagram,Simple numerical problem

(B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle, Effect of compression ratio on efficiency, Simple numerical problems, Graphical representation of ideal and actual cycle, Comparison between actual and ideal cycles, Reasons for variation. Mean effective pressure, Work done during the cycle.

UNIT2

(A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams, Classification of I.C. Engines.

(B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, gaskets, Different cylinder arrangements. Cylinder wear, Forms of combustion chamber in petrol engine Location of spark plug Combustion chamber in Diesel engines, Turbulence in Combustion chambers.

UNIT3:

Engines Details (CONTINUED)

(b) Piston-plain, split skirt, auto-thermic, cam-ground, Anodising and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism, Valve clearance Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod Bearing metal for big and small end of connecting rod (g) Crank shaft, Left hand, right hand crankshaft, Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding).Main bearings, Crankshaft end play, Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT).

UNIT4

(A) Rotary Engine. Principle and operation, Engine cooling, Advantages and limitations.

(B) Internal combustion Turbines. Principle of working, Classification,Brayton cycle, Cycle efficiency, Friction effect, Optimum compression ratio, Simple numerical problems, Deviation of practical cycles, Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials, Turbine blades.

UNIT5

(A) Supercharging and scavenging. Necessity of supercharging, Rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging, Methods and classification of scavenging process, Performance of different scavenging systems.
(B) Engine specifications, specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Thermal Engineering I & II: Sarao, Gambhir&Aggarwal
3. Automobile Engineering II: Kirpal Singh
4. Basic Automobile Engineering: CP Nakra
5. Automobile Engineering: RB Gupta

Auto Body Repair, Denting & Painting

Safety precautions and first aid, Proper use, care and maintenance of tools and equipments Introduction on types, function of body and panels, Procedure for inspection, removing and refitting of body components panels, doors and other body parts, Arc welding-basic electricity and welding power source. Electrodes types, description and specification.arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting, Resistance welding-resistance welding, process-spot, seam and butt welding Details of MIG welding, Method of fixation of wind screen, glass Procedure for cut open, beat out, dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application &primer application at different stages of affected area(chronological order for repair of auto body)fitment of repaired part and aligning to the original shape Personal safety – three key areas of risk eyes, skin and inhalation Details of personal protective, equipments-RPE,PPE Details of ingredients of paint, Procedure of refinishing process, Selection of consumable for doing painting work Procedure for doing painting(in chronological order),selection of materials, tools and equipments application of body filler for surface preparation, sanding on the affected area for smooth surface preparation, primer coating on the affected area, preparing affected surfaces for base coating, applying Base coat painting, clear coat painting for metallic paints, rubbing and polishing,
Application of paint production, treatment/anti rust treatment Procedure for inspection of painting, work and fixing the wind screen glass Details of spray gun-types-standard air, gap design-different sizes of nozzles, Details of different types sanding - 15 equipments Different types of sand paper-grades, Possible defects in painting, objects, causes and its cure.

Reference Books:
Automotive Body Repair & Painting Manual, John Harold Haynes

Automobile Workshop -I

UNIT 1

Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, WagonR, Swift (Petrol & Diesel); Hyundai: Santro, Ford: Figo; Volkswagen: Polo; Chevrolet: Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking

UNIT 2

Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerised wheel aligner

UNIT 3

Measurement of Exhaust Pollution by various analysers such as Four Gas Analyser, Smoke meter, Noxanalyser

UNIT 4

Use of Headlight aligner, Wheel aligner, automotive oscilloscope

UNIT 5

Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focussing and alignment of head lights

Reference Books:

1. Engine Service: Gary Lewis
2. Various Car's Manuals

Auto Body Repair, Denting & Painting Workshop

AUTO BODY REPAIR Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety Simple basic practices on computer reading, service manuals, collision repair manuals and colour matching guide, Identification of different types of body, chassis and drive lines, Identification of location of parts and panels, Practice on operating the air compressor, Practice on periodical maintenance of air compressor Inspect and decide whether it can be repaired or replaced Remove and refit body panels, doors, floors, wheel boxes and fenders Practice on removing and refitting wind shield glasses Practice on arc welding on vehicle body Practice on gas welding, gas brazing, gas soldering and gas cutting on vehicle body Practice on resistance, spot, seam and butt welding on vehicle body Practice on MIG welding Safety precautions and first aid. Proper use, care and maintenance of tools and equipments, Introduction on types, function of body and panels Procedure for inspection, removing and refitting of body components panels, doors and other body parts Arc welding-basic electricity and welding power source. Electrodes types, description and specification, Arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting Resistance welding-resistance welding process-spot, seam and butt welding Details of MIG welding Method of fixation of wind screen glass Procedure for cut open, beat out dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application &primer application at different stages of affected area(chronological order for repair of auto body)fitment of repaired part and aligning to the original shape, Practice on plasma welding, Practice on minor repair of auto bodycut open, beat out, strip out old paint, make smooth surface by using different grades of sanders, apply putty on affected area and applying primer(repair damaged body which is ready for final paint) Apply base coat painting, Fit check the repaired components for alignment

AUTO BODY PAINTING Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety, Practice on removing paint from the damaged area Practice on mixing and applying body filler Practice on sanding(block) Practice on mixing and applying putty Practice on applying primer Practice on feather edge sanding and masking Base coat application Surface cleaning and degreasing Second and third coat application Preheating the vehicle and cooling Cutting, scuffing, rubbing and polishing

Reference Books:

Automotive Body Repair & Painting Manual, John Harold Haynes

Level 6 (Semester IV)
Automobile Engine Systems

UNIT 1

STARTING SYSTEM: Idea of engine starting-system circuitKick-starting system of 2 wheelers Starting of mopeds.

IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and its working, Compression ignition of diesel engines.

LUBRICATION SYSTEM: Lubrication in 2 stroke engines - petroil and oil-injection, Lubrication in 4 stroke multi-cylinder petrol/diesel engines, Dry and wet sump lubrication, Full pressure and semi-pressure lubrication Oil pump types, Oil pump drive, relief valve; pressure gauge. Oil filters. Full-flow and by-pass type filtering systems, Crankcase dilution, crankcase ventilation Positive Crankcase Ventilation.

Properties and functions of a good lubricating oil, Additives, Gradation of lubricating oil due to viscosity.SAE numbers, Service rating, 2T and Super 2T oils for use in 2-s engines.

UNIT 2

COOLING SYSTEM: Necessity of cooling of I.C. engines, Methods of cooling-air cooling, water cooling, liquid cooling, Shape of cooling fins Field of application of air cooling.

Water cooling system - Thermo siphon system, pump system, thermostat system of cooling Thermostat - types Radiators-different types, their construction and function Pressurized cooling system; radiator pressure-cap, surge tank Cooling water temperature gauge Anti-freeze and anti-corrosive additives Coolants Flushing of cooling system.

AUTOMOBILE ENGINE FUELS: Types of fuels. Influence of structure. Calorific value Requirements in fuels for I.C. engines Properties Fuel rating, Additives for S.I. and C.I. engine fuels, Specifications of petrol and diesel Leaded and un-leaded petrol, Low Sulphur diesel Enhancing Power output- Nitrox injection.

Non-conventional fuels - LPG, CNG ethanol-mixed petrol, Properties, method of manufacture and their performance as I.C. engine fuels, Engine modifications required, Dual mode engine,
Idea of Electric Vehicles and Hybrid Vehicles.

UNIT 3

FUEL SYSTEM OF DIESEL ENGINES: Fuel supply system, Filters (primary and secondary); positioning of filters, Feed pump Solid and air injection system Fuel injection pump, different types- plunger, distributor pump, their construction and working, Injectors Governors Types of governing Combustion process in diesel engine, Diesel knock, Electronically Controlled Diesel Injection Pump Common Rail Direct Injection Piezoelectric effect and its use in CRDI.

UNIT 4

FUEL SYSTEM OF PETROL ENGINES: Gravity feed system used in 2-wheelers, Fuel supply circuit of 4-wheelers.Mechanical and electrical fuel pump, Electric fuel gauge, Petrol fuel filter, Air/fuel ratio, Variation of air/fuel ratio with speed, Air cleaners (wet & dry).Cyclone filter.

CARBURETOR - Function and principle of working of simple carburetor. Carburetor controls- throttle, choke. Types of Carburetors- fixed jet carburetor (Solex type) and constant vacuum carburetors used

in YAMAHA motorcycle, Twin-barrel carburetors, Classification of carburetors, Disadvantages of carburetors Phenomenon of combustion and detonation Pre-ignition.

UNIT 5

FUEL INJECTION SYSTEMS (PETROL ENGINE): TBI, MPI; the Electronic Module, Advantages of Electronic Fuel Injection (EFI). Block diagram of the EFI, The Air Intake System and the Idle Air Control System. Fuel Delivery System. Various sensors used with the ECM, their location and purpose. Fuel Injector, Idea of Gasoline Direct Injection ENGINE PERFORMANCE AND TESTING: Various losses in an engine. Heat balance, Morse method of finding IHP, Calculation of various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, specific fuel consumption. Performance curves.

Reference Books:

Automotive Engines, A.K. Babu, Khanna Publishing House

Automotive Refrigeration & Air-conditioning

Unit-I: Refrigeration Fundamentals: Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air conditioning.

Unit-II: Refrigerants and Air Conditioning Components: Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination

Unit-III: Air distribution system: Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance

Psychrometry: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.

Unit-IV: Load analysis and control devices: Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and actuators.

Unit-V: Diagnostics, Trouble Shooting, Service and Repair: Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass. Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting. Removing and replacing components, Compressor service.

Reference Books:

Refrigeration & Air Conditioning, Sadhu Singh, Khanna Publishing House

Vehicle Performance & Testing

Unit-I: Vehicle Performance Parameters: Vehicle Performance parameters: Fuel economy, acceleration, deceleration, gradability, top speed, handling, comfort, life durability, EGR systems, Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function andconstruction, Lambda close loop control system for gasoline vehicles.

Unit-II: Drive train and Component testing: Vehicular transmission performance: comparison of automotive clutches,Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.

Unit-III: Vehicle testing: Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle.

Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water

Laboratory testing:Testing on chassis dynamometer, transition testing (Euro III onwards), accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test.

Collisions and Crash Testing:Crash testing: Human testing, dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.

Unit-IV: Comfort, Convenience and Safety: Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system, Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.

Unit-V: Noise Vibration and EMI: Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement. Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.

Reference Books:

Road Vehicle Performance: Methods of Measurement and Calculation, George Gordon Lucas

Electrical & Hybrid Vehicles – II

Unit -I: Hybrid Architecture and Power Plant Specifications: Series configuration locomotive drives- series parallel switching- load tracking architecture. Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT)- wheel motors. Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.

Unit -II: Sizing the Drive System and Energy Storage Technology: Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters

Unit-III: Fuel Cells: Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra capacitors- PEM fuel cell vehicles.

Unit IV: Energy Storage: Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel-Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.

Unit -V: Nonelectric Hybrid Systems: Short term storage systems flywheel accumulators, continuously variable transmissions hydraulic accumulators hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.

Reference Books:

1. Electric & Hybrid Vehicles, A.K.Babu, Khanna Publishing House
2. Impacting Rapid Hydrogen Fuel Cell Electric Vehicle Commercialization David.L. Wood

Automotive RAC Lab.

1. Test on vapor compression test rig.
2. Test on air conditioning test rig.
3. Study of various methods of transport refrigeration systems.
4. Study and demonstration on car and bus air conditioning system.
5. Study of latest trends in automotive refrigeration systems.
6. Study and demonstration of controls in refrigeration.
7. Study of different components with the help of cut sections/models/charts- Compressor, Condenser, Evaporators, Expansion device, Blower fans, Hating systems etc.
8. Study of installation/operations/maintenance practices for refrigeration systems.
9. Study of leak testing and leak detection methods.
10. Visit to maintenance shop of automotive air conditioning and writing report on it.

Vehicle Performance & Testing Lab

1. Estimation of power requirement for vehicle propulsion by taking actual vehicle example.
2. Perform coast down test to find vehicle inertia.
3. On road fuel consumption test at different speeds.
4. Brake efficiency measurement
5. Pass- by noise test.
6. Free acceleration test.

7. Vibration measurement in passenger compartment
8. Laboratory testing of vehicle on chassis dynamometer for performance
9. Laboratory testing of vehicle on chassis dynamometer for emission.
10. Report based on visit to vehicle testing and research organization.
11. On road emission testing of petrol and diesel vehicles for PUC/RTO.

Level 7 (Semester V)

Automotive System Design

Unit-I:

Design of Clutches & Gearbox:

Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch. Selection of gear ratios and final drive ratio, numerical on 3- speed and 4- speed gearbox.

Unit-II:

Design of Propeller Shafts and Axles:

Design of propeller shafts for bending, torsion and rigidity, Design of universal joints and slip joints, final drive, Design of live and dead axles.

Unit-III:

Brake Systems:

Design of hydraulic braking system, internal expanding shoe brake and disc brake, design of master and wheel cylinder and piping design.

Unit-IV:

Design of Suspension and Steering System:

General design considerations of suspension system, design of helical and leaf springs for automobile suspension system, design considerations of belleville springs, elastomeric springs, design considerations of steering system and vehicle frame design.

Unit-V:

Statistical Consideration in Design and Optimization:

Ergonomics and aesthetic design, statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability, introduction to design optimization of mechanical elements, adequate and optimum design, methods of optimization, johnson's method of optimum design-simple problems in optimum design like axially loaded members.

Reference Books:

1. Automotive Systems Engineering, Hermann Winner, Markus Maurer
2. Automotive Mechanics – SIEWilliam Crouse

Alternative Fuel and Emission Control

Unit-I: Conventional Fuels and Need for alternative fuels: Estimate of petroleum reserve and availability - comparative properties of fuels- diesel and gasoline, quality rating of SI and CI engine fuels, fuel additives for SI and CI engines, thermodynamics of fuel combustion - introduction to chemical thermodynamics, chemical reaction - fuels and combustion, enthalpy of formation and enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, need for alternative fuels, applications, types etc.

Unit-II: Alternative Fuels: Gaseous Fuels and Bio-fuel: Introduction to CNG, LPG, ethanol, vegetable oils, bio-diesel, biogas, Hydrogen and HCNG. Study of availability, manufacture, properties, storage, handling and dispensing, safety aspects, engine/vehicle modifications required and effects of design parameters performance and durability

Synthetic Fuels Introduction to Syngas, DME, P-Series, GTL, BTL, study of production, advantages, disadvantages, need, types, properties, storage and handling, dispensing and safety, discussion on air and water vehicles.

Unit–III: Emission Control (SI Engine): Emission formation in S.I. engines - Hydrocarbons, carbon monoxide, oxides of nitrogen, poly-nuclear aromatic hydrocarbon, effects of design and operating variables on emission formation in spark ignition engines, controlling of pollutant formation in engines exhaust after treatment, charcoal canister control for evaporative emission control, emissions and drivability, positive crank case ventilation system for ubhc emission reduction.

Unit-IV: Emission Measurement and Control (CI Engine): Chemical delay, intermediate compound formation, pollutant formation on incomplete combustion, effect of design and operating variables on pollutant formation, controlling of emissions, emissions and drivability, exhaust gas recirculation, exhaust after treatment – doc, dpf, scr and lnt. Measurement and test procedure (ndir analyzers, fid, chemiluminescencenox analyzer, oxygen analyzer, smoke measurement, constant volume sampling, particulate emission measurement, orsat apparatus.)

Unit-V: Health effects of Emissions from Automobiles: Emission effects on health and environment. Emission inventory, ambient air quality monitoring, Emission Norms: As per Bharat Standard up to BS– IV.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Engine Emissions: Pollutant Formation and Advances in Control TechnologyB.P. Pundir

Automobile Maintenance Service & Repairs – I

Unit 1:

Workshop Equipment

Equipment for testing electrical accessories: Electric test bench, growler, coil tester, ignition and cam-dwell-angle tester; wiring harness tester. Ampere-hour battery tester, voltmeter tester, Layout of diesel injector and F.I.P. reconditioning shop, Tools and equipment required

Unit 2:
Lubrication and Maintenance Schedule

Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles

(a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential (g) Axles and hubs

Unit 3:
Lubrication and Maintenance Schedule

(a) Suspension system (b) Steering system (c) Tyre (d) Chassis (e) Brake-drum and disc

(f) Battery (g) Self starter (h) Dynamo

Unit 4:
Fuel System

Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipe lines, priming unit, tanks. Electricals: Maintenance Schedule of batteries, starter motor, dynamo, ignition system, wiper motor, electrical fuel pump, alternator, horn, flasher unit.

Unit 5:
Engine Tuning

(a) Engine tuning of conventional and MPFI petrol engine. Adjustments of spark plug gap, valve tappet clearance, head bolts, Use of vacuum and compression gauge, Air cleaner cleaning, Ignition timing setting by timing light, Pollution checking, Troubleshooting

Reference Books:
Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Automotive NVH

Unit-I:

Introduction to NVH and Vibrations:
Noise Vibration and Harshness (NVH) and its role in automotive design and development. Physiological effects of noise and vibration, sources of vibration and noise in automobiles, Basic concepts of vibration, time period, frequency, SHM, types of vibration, Natural frequency, resonance, damping, mathematical models.

Unit-II

Vibration Control and Measurement:
Different types of dampers, vibration absorbers, centrifugal pendulum, dry friction, untuned viscous, vibration isolation, Instruments, vibrometer, velocity pick-ups, frequencymeasurement instrument.one applications: isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft.

Unit-III:

Noise Fundamentals:
Fundamentals of acoustics–general sound propagation–structure borne sound and air borne sound, plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity, spherical wave propagation – acoustic near and far fields, reference quantities, the decibel scale

Unit-IV:

Sound Analysis:
Anatomy of human ear, mechanism of hearing, loudness, weighting networks, equivalent sound level, relationship among sound power, sound intensity and sound pressure level.

Unit V:

Automotive Noise Sources and Control Techniques
Methods for control of engine noise, transmission noise, intake and exhaust noise, aerodynamic noise, tyre noise, brake noise.
Noise control strategy, noise control at source – along the path isolation, damping, balancing, resonators, absorption, barriers and enclosures.

Reference Books:
1.Automotive NVH Technology (SpringerBriefs in Applied Sciences and Technology),**Fuchs**, Anton, **Nijman**, Eugenius, **Priebsch**, Hans-Herwig (Eds.)

Automobile Workshop - II

1. Find the mechanical efficiency of a multi-cylinder engine by Morse Test
2. Tune a multi-cylinder petrol engine and set dwell, rpm, ignition timing, CB point gap, spark plug gap, and tappet clearance.
3. Check the condition of the given battery as regards: (i) cell voltage (ii) specific gravity (iii) ampere-hour capacity (iv) Level of electrolyte. Use battery capacity tester. Clean the battery and charge it. Prepare a maintenance schedule.
4. Dismantle study, assemble and check for proper working the following: (a) Electric horn (b) Wiper motor (c) Starter motor (d) dynamo (e) alternator.
5. Test the following on electrical test bench: (a) Dynamo (b) Starter motor (c) Alternator. Also study the working of a growler.
6. Dismantle, inspect and assemble the magneto of a 2-wheeler. Set the ignition timing using dial gauge.
7. Dismantle and assemble the given electrical fuel pump. Check it for proper working.
8. Set the cut-out and regulator of a vehicle.
9. Dismantle, study, and re-assemble multi-cylinder F.I. pump.
10. Test a multi-cylinder F.I. pump on calibrating machine and check it for proper phasing. Set the injection timing on the engine.
11. Test a diesel fuel injector and set injection pressure. Grind needle and seat.
12. Study and sketch rotary F.I. pump.
13. Study of working of electric vehicle.
14. Study and sketch the Electrical Wiring System of a Car.

Design of Automotive Systems Lab

1. Design of automotive clutch assembly and component drawing using any drafting software (Two full imperial sheets along with design calculations report) consists of:

- Functional design of clutch
- Design of clutch shaft, hub and flange
- Design of damper springs
- Design of sectors, rivets etc.
- Design of pressure plate assembly
- Design for linkage mechanism
- Details and assembly drawing
- Details and assembly drawing

2. Design of automotive gear box along with reverse gear (Two full imperial sheets along with design calculationsreport) consists of:

- Calculation of gear ratios
- Determination of number of teeth on gear pair
- Determination of gear reductions
- Design of gear pairs
- Design of shafts
- Selection of bearings
- Details and assembly drawing

3. Design of suspension spring and its analysis using any analysis software.

Automobile Maintenance Service & Repairs – I

Unit 1:

Workshop Equipment

Equipment for testing electrical accessories: Electric test bench, growler, coil tester, ignition and cam-dwell-angle tester; wiring harness tester. Ampere-hour battery tester, voltmeter tester, Layout of diesel injector and F.I.P. reconditioning shop, Tools and equipment required

Unit 2:

Lubrication and Maintenance Schedule

Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles (a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential (g) Axles and hubs

Unit 3:

Lubrication and Maintenance Schedule

(a) Suspension system (b) Steering system (c) Tyre (d) Chassis (e) Brake-drum and disc (f) Battery (g) Self starter (h) Dynamo

Unit 4:

Fuel System

Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipe lines, priming unit, tanks. Electricals: Maintenance Schedule of batteries, starter motor, dynamo, ignition system, wiper motor, electrical fuel pump, alternator, horn, flasher unit. Unit 5: Engine Tuning (a) Engine tuning of conventional and MPFI petrol engine. Adjustments of spark plug gap, valve tappet clearance, head bolts, Use of vacuum and compression gauge, Air cleaner cleaning, Ignition timing setting by timing light, Pollution checking, Troubleshooting

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Automotive Technology:Service And MaintenanceDon Knowles

Off-Road Vehicles

Unit 1:

Classification and Requirements of Off Road Vehicles

Introduction, pretest, history and overview of an off-road machines, construction layout, capacity and applications, power plants, chassis and transmission, multi-axle vehicles

Unit 2:

Earth Moving Machines

Different types of earth moving equipments and their applications. Bulldozers, cable and hydraulic dozers, Crawler track, running and steering gears, scrapers, drag and self powered types - Dump trucks and dumpers - Loaders, single bucket, multi bucket and rotary types - Power and capacity of earth moving machines.

Unit 3:

Farm Equipments& Tractors

Scrappers, elevating graders, motor graders, self powered scrappers and graders, power shovel, revolving and stripper shovels, drag lines, ditchers, capacity of shovels Tractors: General description, specification and functions, light, medium and heavy wheeled tractors, crawler tracks mounted / wheeled-bull dozers, tilt dozers and angle dozers, front end loaders, factors affecting efficiency of output of tractors, simple problems, merits and demerits

Unit 4:

Combat Vehicles and Vehicle Systems

Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles Vehicle Systems: Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics, Hydro-pneumatic suspension cylinders, Power steering system, Kinematics for loader and bulldozer operational linkages, Safety features, safe warning system for dumper, Design aspects on dumper body, loader bucket and water tank of sprinkler

Unit 5:

Vehicle Evaluation Mobility

Soil-Vehicle Mechanics, characteristics of soils, nominal ground pressure, mean maximum pressure, the mobility index (mi), vehicle cone index (vci) and rated cone index (rci), mobility number, dynamic behavior and traction on wet soil, traction performance and factors affecting traction performance

Reference Books:

1.Off-road Vehicle Dynamics: Analysis, Modelling and Optimization Hamid, Aref Mardani
2.Road and Off-Road Vehicle System, Manfred Ploechl
3.Off-Road Vehicles, Ian Graham

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Production Technology (PT)
Branch Code:103

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Production Technology

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV511	Machine Tool Technology	30	10	5	5	20	30		**50**	**2**
2	BPTV512	General Mechanical Engineering-I	30	10	5	5	20	30		**50**	**2**
3	BPTV513	Production Technology	30	10	5	5	20	30		**50**	**2**
4	BPTV514	Metrology and Measuring Instruments	30	10	5	5	20	30		**50**	**2**
5	BPTP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BPTP512	Machine Tool Technology Lab	30				20		30	**50**	**1**
7	BPTP513	Language Lab	30				20		30	**50**	**2**
8	BPTT511	Metal Arc Welding (CSC/Q0204)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BPTT512	MIG MAG or GMAW Welder (CSC/Q0209)									
	BPTT513	Assistant TIG Welder (CSC/Q0212)									
	BPTT514	CNC Setter Cum Operator (CSC/Q0120)									
	BPTT515	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV521	Industrial Management	30	10	5	5	20	30		**50**	**2**
2	BPTV522	Manufacturing Technology	30	10	5	5	20	30		**50**	**2**
3	BPTV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BPTV524	General Mechanical Engineering-II	30	10	5	5	20	30		**50**	**2**
5	BPTP521	Project	30				20		30	**50**	**1**
6	BPTP522	Basic Electricity and Electronics Lab	30				20		30	**50**	**1**
7	BPTP523	Mechanical Workshop Practice Lab	30				20		30	**50**	**2**
8	BPTT521	Metal Arc Welding (CSC/Q0204)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BPTT522	MIG MAG or GMAW Welder (CSC/Q0209)									
	BPTT523	Assistant TIG Welder (CSC/Q0212)									
	BPTT524	CNC Setter Cum Operator (CSC/Q0120)									
	BPTT525	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV631	Metal Casting Technology	30	10	5	5	20	30		**50**	**2**
2	BPTV632	Production Automation & Computer Integrated Mfg.	30	10	5	5	20	30		**50**	**2**
3	BPTV633	Fundamental of Mechatronics	30	10	5	5	20	30		**50**	**2**
4	BPTV634	Machining and Machine Tools	30	10	5	5	20	30		**50**	**2**
5	BPTH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		**50**	**2**
6	BPTP631	Metal Casting Technology Workshop	30				20		30	**50**	**1**
7	BPTP632	Mechatronics Lab	30				20		30	**50**	**1**
8	BPTT631	Service Engineer – Installation (CSC/Q0501)					Any one Training 400 hrs/ 8 weeks			**150**	**12**
	BPTT632	Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)									
	BPTT633	CNC Programmer (CSC/Q0401)									
	BPTT634	Maintenance Fitter – Mechanical (CSC/Q901)									
Total			**610**							**500**	**24**

NSFQ Level 6 SEMESTER- IV											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV641	Mass Production Devices	30	10	5	5	20	30		**50**	**2**
2	BPTV642	Agile and Lean Manufacturing	30	10	5	5	20	30		**50**	**2**
3	BPTV643	Metal Forming Processes	30	10	5	5	20	30		**50**	**2**
4	BPTV644	Non-Conventional Machining	30	10	5	5	20	30		**50**	**2**
5	BPTH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		**50**	**2**
6	BPTP641	Tool and Die Making Lab	30				20		30	**50**	**1**
7	BPTP642	IT Tool Lab	30				20		30	**50**	**1**
8	BPTT641	Service Engineer – Installation (CSC/Q0501)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			**150**	**12**
	BPTT642	CNC Programmer (CSC/Q0401)									
	BPTT643	Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)									
	BPTT644	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			**610**							**500**	**24**

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BPTV751	Reliability ,Maintenance & Safety Engineering	30	10	5	5	20	30		50	2
2	BPTV752	Plant Layout and Product Handling	30	10	5	5	20	30		50	2
3	BPTV753	Product Design and Manufacturing	30	10	5	5	20	30		50	2
4	BPTV754	CAD & CAM	30	10	5	5	20	30		50	2
5	BPTH751	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BPTP751	CAD Lab	30				20		30	50	1
7	BPTP752	CAM Lab	30				20		30	50	1
8	BPTT751	Tool & Die Maker (CSC/Q0306)					Any one Training 400 hrs/ 8 weeks			150	12
	BPTT752	Designer – Mechanical (CSC/Q0405)									
	BPTT753	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BPTV761	Rapid Prototyping and Reverse Engineering	30	10	5	5	20	30		50	2
2	BPTV762	Production Planning and Control	30	10	5	5	20	30		50	2
3	BPTH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BPTP761	Major Project	180						150	150	6
5	BPTT761	Tool & Die Maker (CSC/Q0306)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BPTT762	Designer – Mechanical (CSC/Q0405)									
	BPTT763	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Machine Tool Technology

Unit 1: Centre Lathe

The centre lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Head stock and tail stock, feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrils, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe

Unit 2: Shaping, Planing& Slotting Machines

Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

DRILLING & BORING MACHINES: Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

Unit 3: Milling Machines

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks

Unit 4: Grinding Machines

Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing.

BROACHING MACHINES: Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines

Unit 5: Jigs and Fixtures

Object of Jigs and Fixture, Difference between jigs and fixtures, Principle of location, Principle of clamping, Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs-bushes (Fixed, Liner, Renewal, and Slip). Template, Plate jigs. Channel jigs, Leaf jigs, Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures. Welding fixtures

COOLING PROCESS: Cooling and cutting fluids, difference between coolant and cutting fluid, function and action of cutting fluids, Requirement of good cutting fluids, their selection for different materials and operationsAUTOMATION OF MACHINE TOOLS: Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

Reference Books:

1. Production Technology: Jain & Gupta
2. Workshop Technology Vol. II: Hazra&Choudhary

General Mechanical Engineering – I

Unit 1: Strength of Materials & Power

Transmission

Stress, strain, elastic constraints, stress in circular shaft subjected to pure torsion only, Riveted and bolted joints.

Unit 2: Shear Force & Bending Moment

Elementary idea of Shear force and bending moment for concentrated, uniformly distributed loads on simply supported beam cantilever and overhanging beam, Simple Shear force and bending moment diagrams, Relationship between shear force and bending moment

Unit 3: Power Transmission: Pulleys, Gears & Shaft

Classification of Pulleys, Types of Belts, Simple calculation of pulley diameter, Classification of Gears, Simple calculation of number of teeth and speed, Power transmission by solid and hollow shaft

Unit 4: Hydraulics & Hydraulic Machines

Properties of fluids, pressure of fluid and its measurement. Flow of fluids, velocity and discharge, Bernoulli's theorem and its application in venturimeter, flow through pipe, head loss due to friction

Unit 5: Water Turbines & Pumps

Capacity & Working of Turbines- Pelton and Reaction, reciprocating and centrifugal pump

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House

Production Technology

Unit 1

Production Machine Tools: Machine tools used for quantity production, semi-automatic multi tools centre lathe. Auto-lathes, sliding head types, Single spindle automatics, Multi-spindle automatics, Mechanical copying systems, Hydraulic servo copying systems for lathe, Electric copying systems.

TRANSFER MACHINES: Types of productions. Types of layout, Economic justification of transfer machines, Inline transfer, drum type transfer machines. Automatic loading & Transferring methods, Machining heads, Automatic inspections, Tool servicing, Transfer press linked lines.

Unit 2

Generation Of Forms: Forming `V' generating. Thread chasing. Die heads. Threadrolling. Thread milling. Thread grinding. Gear planning, Gear shaping, Gear hobbing, Straight Bevel Gear Manufacture. Spiral bevel Gear Manufacture.

Unit 3

Surface Treatment & Finishing: Meaning of the terms surface treatment and itspurpose, Elements of surface treatment cleaning protecting, Colouring, Altering surface properties.

Surface Treatment Processes- Wire brushing, Belt sanding, Alkaline cleaning, Vapour degreasing, Pickling, Latest trends in Surface preparation, Ultrasonic cleaning, Solvent cleaning, Painting application by dipping, Hand spraying, Automatic spraying, Electrostatic spray finishing. Electro-coating, Hot dip coating, phosphate coating- Packerising and bonderasing, Buffing, Blackening, Anodising. Electro Nickle Plating, Nickle carbide plating, Sputtering, Automation in Painting,

AUTO CONTROL OF SIZE: Auto sizing, Mechanical calliper for turning operation, Pneumatic sizing of external cylindrical ground work, Pneumatic slide position measuring device, Digital slide position measuring device, Auto sizing device for centre-less grinding operation. Friction rollers, Optical measurement

Unit 4

Cutting Tools For Machining: Elements of machining process, Single point tools -Basic angles, Chip formation, Effect of manipulating factors such as velocity, size of cut, effect of tool geometry, Tool material, Cutting fluids and contamination in them, Work piece material, Tool life model, Machining economics, Specific power consumption

Basic principles of multipoint tools, Linear travel tools, Broaches, Gear shaper cutters, Axial feed rotary tools-Twist drill, Reamers, Core drills, Counter bores and counter sinks, Multiple diameter tools, Hobs,Characteristics of tools materials,. Tool materials, Tool steels, High speed steel, Cast cobalt alloys. Carbides or cintered carbide, Ceramics, Carbide tools

Surface treatment of cutting tools- Its advantage, Tin coated high speed steel diamonds. Cubic boron nitrides, Specialised knowledge of steel cutting

Unit 5

Press Tools: Factors affecting press tool design, Shearing, Bending, Drawing,combination tools, Progression tools, Rubber die formatting, high energy forming, Explosive formingSPECIFICATION OF QUALITY & RELIABILITY: Quality, Specification Designing for production Standardisation, Preferred numbers, Limits and fits, Tolerance build up, Geometric tolerances. Limit gauging

Reference Books:

(i) Production Engineering: PC Sharma

(ii) Production Technology: CK Singh

Metrology and Measuring Instruments

Unit 1

Introduction: Meaning and scope of metrology in field of engineering, Standards andtypes of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error
PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:
(i) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw andscrew nut method, compound gearing and helical spring methods.
(ii) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors.
(i) Principles of Electrical measuring Instruments.
(ii) Principles of Hydraulic and Pneumatic Instruments.

Unit 2:
Comparators
General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

Unit 3:
Surface Finish
Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

Unit 4
Various Types of Instruments Used For:
1. (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer

2. Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only)

TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

Unit 5

Inspection of Geometrical Errors:
Construction and working of auto collimeter,checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod).

Maintenance Of Measuring Instruments: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:
1. Metrology: RK Jain
2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments lab.

Bridge Course to be merge with practical classes:

Introduction of scale, orthographic projection, simple drawing of mechanical components, and cut sections, significance of various types of lines used in engineering drawing, representation of material, brief idea of isometric projections

Types of thread, single start, multi start thread and their application

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto- collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Machine Tool Technology Lab.

(A) MACHINE SHOP

1. (a) Square thread cutting (internal and external) - 2 jobs

   (b) Multi-start thread cutting - 1 job

   (c) Eccentric Turning - 1 job

2. Making utility job - Planner, Shaper, Slotter - 1 job

3. Group work on milling machine involving up & down milling in:

   (a)Gang milling - 1 job

   (b)Spur gear cutting - 1 job

   (c)Helical gear cutting - 1 j

(B) FITTING SHOP

1. To make a cut and cup tool - 1 job
2. To make blank and pierce tool - 1 job
3. To make a male and female fitting jobs - 1 job
4. To grind a lathe/shaper/planer tool - 1 job
5. To make different types of keys - 3 jobs
6. To make complete gauge - 2 jobs

Level 5 (Semester II)
Industrial Management

Unit 1

Introduction

Growth of industry, The management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

Unit 2

Private sector and public sector:

Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit 3

Wages & incentives

Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.

Unit 4

Labour, industrial & tax laws:

Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit 5

Material management:

Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards.

Reference Books:

1. Industrial Engineering and Management, S.C. Sharma, Khanna Publishing House
2. Industrial Safety, S.C. Sharma, Khanna Publishing House
3. Industrial Engineering & Management: Banga, Sharma & Agrawal
4 . Industrial Engineering Safety & Pollution (Hindi): HemendraDutt

Manufacturing Technology

Unit 1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Riveting, Elementary idea of machines used for the above processes.

Unit 2

WELDING:

(a) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

(b) Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding and Gas welding (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG) (vi) Tungsten Inert Gas welding (TIG)

WELDING OF SPECIAL MATERIALS: (a) Welding of carbon steel, Low alloy steel and stainless steel, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron (c) Welding of Aluminium (d) Welding of Plastics.

Unit 3

Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools-Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Unit 4

Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects

MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

FOUNDRY PRACTICE: Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanization of foundries

Unit 5

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)
TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods-Tensile Test, Hardness Test, Fracture Test, Impact Test (b) Nondestructive methods-visual, Liquid Penetrant Testing, Magnetic particles Testing, Radiographic Testing.
Advance Welding Process: Plasma Arc Welding, Laser Beam Welding, Electron Beam welding, Atomic Hydrogen arc welding, Stud welding, Explosion welding.

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi
2. Production Technology, Vol. I: Hazra& Chaudhry

Material Science & Materials

Unit 1

General:

Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

STRUCTURE OF METALS AND THEIR DEFORMATION:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

Unit 2:

Metals-Ferrous Metals

1. Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications (d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

Unit 3:

Non-Metallic Materials

Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.

Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

Unit 4

IDENTIFICATION AND TESTING OF METAL ALLOYS: Selection, specification forms and availability of materials.

HEAT TREATMENT OF METALS: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:

Material Science: RS Khurmi& RS Shedha

General Mechanical Engineering - II

Unit 1:

Basics of Thermodynamics

Basic definition of heat, work, Thermodynamic process, parameters of working body and their units, Equation of state, Universal gas constant, Relation between heat capacity and temperature. Determination of quantity of heat

Unit 2:

Laws of Thermodynamics

Elementary concept of laws of thermodynamics, first law and second law, Graphical representation of process, The work of expansion and compression of a gas, Change in the state of ideal gas-Isochoric, Isothermal and Adiabatic process, Carnot-cycle

Unit 3:

IC Engines

External & internal combustion engines, working of diesel and petrol engine, horse power of IC engines,

Unit 4:

Steam Generators & Condensers

Construction and working of Babcock & Wilcox boiler, Cochran boiler, Steam condenser & its types

Unit 5: Steam & Gas Turbines

Steam turbine, classification and principle of operation, gas turbine

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House
3. General Mechanical Engineering: Jk Kapoor
4. Mechanical Engineering: Khurmi& Gupta

Project

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Basic Electricity & Electronics - Lab

Bridge course:

Introduction to current, voltage, resistance, capacitance, impedance, diode, zener diode, transistors, amplifiers, electric cells

1. Study of series resistive circuits.
2. Study of parallel resistive circuits.
3. Study of series and parallel connection of cells in circuits.
4. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
5. Charging and Discharging of a capacitor.
6. Verification of magnetic field of solenoid with Iron core and Air core.
7. Verification of Torque development in a current carrying coil in magnetic field.
8. Study of R.L.C. series circuit and measurement of power and power factor.
9. Study of current and voltage measurement using Ammeter and Voltmeter.
10. Study of current and voltage measurement using Galvanometer.
11. Study of current, voltage and resistance measurement using of Multi-meter
12. Study of Power and Energy measurement using Wattmeter and Energy meter.
13. Study of working of single layer PCB manufacturing.
14. Study of working of double layer PCB manufacturing.
15. Study and interpreting circuit diagram and to check the continuity of connections.

Instrument Required:

1. Trainer kit for measuring TCR
2. Lead acid battery
3. Hydrometer
4. Trainer kit for measuring power and power factor in RLC circuits
5. Ammeter
6. Voltmeter
7. Multi-meter
8. Galvanometer
9. Energy Meter
10. PCB Manufacturing Facility

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (SEMESTER- III)
Metal Casting Technology

Unit 1

Introduction
Design advantages of casting, Advantages of casting process, Metallurgical advantage. Technology of pattern making requirement, Pattern material, wood &wood product, plaster, Plastics and rubbers, Polyesters resins waxes, Machines and tools for pattern making machine for wood pattern making, Machines for metal pattern making, Allowance and other Technological considerations – contraction allowance, Machining allowance, Draft or taper allowance, Rapping and shake allowance, Distortion allowance, Core Prints, Core boxes, Use of loose pieces

Unit 2

Technology of moulding and core making
Moulding sands, Principal ingredients of moulding sands, Specification and testing of moulding sands, Classification of Moulding sands, Additives to moulding and Core making sands, Mould Dressings. Sand Conditioning, Sand Preparation equipment.

Unit 3

Moulding processes
Types of sand moulding, Tools for hand moulding, Characteristics of cores and core sands, Types of cores, Use of chaplets, Machine moulding, Core making machines, Processes based on organic binders.

Unit 4

Technology of metal casting processes
Permanent mould casting, Types of die casting machines, Centrifugal casting, continues casting, Electro slag casting, Gating system, Riser of casting, Economic considerations, Melting equipments for foundries, Defects in castings.

Unit 5

Modernization & Mechanization of foundries
Need, Area for mechanization, Material handling, Pollution control in foundries, Pollutants in a foundry, Plant layout for foundries, steps in planning a foundry layout.

Reference Books:

1. Evolution of Metal Casting Technologies,Khan, Muhammad Azhar Ali, Sheikh, Anwar Khalil, Al-Shaer, Bilal Suleiman
2. Foundry technology,Peter R. Beeley

Production Automation & Computer Integrating Manufacturing

UNIT 1

General: Automation-Definition, Scope, its types and their merits, reasons for automation, Its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM) Relationship between CIM and Automation FUNDAMENTALS OF MANUFACTURING AND AUTOMATION: Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production). Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control

UNIT 2

Production Concept:

Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing. PRODUCTION ECONOMICS: Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process.

UNIT 3

Assembly System and Line Balancing:

The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line AUTOMATED ASSEMBLY SYSTEMS: Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines, Analysis of single station assembly machines

UNIT 4:

Numerical Control Production System

Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS

UNIT 5

N.C. Part Programming: Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part programming using CAD/CAM and Computer automated part programming. DNC, CNC & ADAPTIVE CONTROL: Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System)

Reference Books:

1. Numerical Control Machines: NK Mehta
2. Production Automation & Computer Integrated Manufacturing: MP Groover

Fundamentals of Mechatronics

Unit 1.

Introduction: Introduction to Mechatronics, systems, measurement systems, control systems, the Mechatronics approach. Introduction to Transducers: Sensors and transducers, operating characteristics of transducers, measurement of displacement, velocity, pressure, flow, and temperature.

Unit 2.

Signal conditioning: Signal conditioning- their features and various blocks, the operational amplifiers, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing. Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition system, Telemetry- electrical, optical and pneumatic methods of telemetry.

Unit 3.

Introduction to process control systems: Importance of process control, analog and digital processing, Supervisory digital control, direct digital control. Controller Characteristics: Process characteristics, control system parameters, Discontinuous controller modes (two position, multiple position, floating position), Continuous controller modes i.e. P, I, D, PI, PD, PID.

Unit 4.

Introduction of Mechanical Actuation Systems: Mechanical Actuation Systems for motion, Kinematics chains, Cams, Gear trains, Belt and chain drives, Bearings. Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Process control valves, rotary actuators.

Unit 5.

Introduction of Electrical Actuation Systems: Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors.

Reference Books:

1. Mechatronic Systems: Fundamentals,R. Isermann
2. Fundamentals Of Mechatronics,M.Jouaneh

Machining and Machine Tools

Unit 1
Classification of Metal Removal Process and Machines Mechanics of Metal Cutting:

Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS, NRS and interrelationship, introduction of mechanism of chip formation and types of chips, chip breakers, orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface, temperature, friction in metal cutting.

Unit 2
Machinability:

Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability, Cutting fluids, types, properties, selection and application methods, General Purpose Machine Tools: tooling, attachments and operations performed, selection of cutting parameters, Simple calculation of time for machining.

Unit 3
Special Purpose Machine Tools:

Automatic lathes, capstan and turret lathe machines, tracer attachment in machine tools, mechanical-copying machines, Hydraulic tracing Devices, Electric tracing systems, Automatic tracing, Abrasive Processes: Abrasives, natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding, machines for surface and cylindrical grinding, their constructional details and processes, surface finishing, honing, lapping, super finishing, polishing and buffing processes.

Unit 4
Thread and Gear Manufacturing:
Casting, thread chasing, thread cutting on lathe, thread rolling, die threading and tapping, thread milling, thread grinding, Gear Manufacturing Processes: Hot rolling, stamping, powder metallurgy, extruding etc. gear generating processes, gear hobbling, gear shaping, gear finishing processes, shaving, grinding, lapping, shot blasting, phosphate coating, gear testing.

Unit 5
High Velocity Forming Methods:
(High-energy rate forming processes) Definition, Hydraulic forming, explosive forming, electro-hydraulic forming, magnetic pulse forming

Reference Books:
1. Machine Design, Sadhu Singh, Khanna Publishing House
2. Machine Design Data Book, Sadhu Singh, Khanna Publishing House

Metal Casting Technology Workshop

Minimum work in each section is indicated against that PATTERN MAKING: (a) Making Patterns (At least two) (i) Solid one-piece pattern (ii) Split tow piece pattern (iii)Split three-piece pattern (iv) Gated pattern (b) Making Core Boxes (At least one) (i) Straight Core Box (ii) Bent Core Box.

MOULDING SAND PREPARATION AND TESTING: (a) Sand Testing (At least one Experiments) (i) Grading (Grain Size). (ii) Determination of Moisture content (iii) Determination of Clay content. (iv) Determination of Permeability for gases (b) Preparation of: (i) Green Sand Composition. (ii) Dry sand Composition. (iii)Loan Sand composition (iv) Oil Sand for Cores.

MOULDING: (a) Making at least 3 sands moulds of different forms with different types of pattern using. (i) Floor Moulding. (ii) Two Box Moulding. (iii)Three Box (or more) Moulding. (b) At least one of the following: (i) Making and setting of cores of different types. (ii)Making one shell mould apparatus

(C) MELTING AND POURING: (Each to be demonstrated at least once in the section). (a) Demonstration of Melting of cast iron in (i) Pit Furnace. (ii) Cupola. (b) Demonstration of Melting a non-Ferrous metal in (i) Pit furnace. (ii) Tilting Furnace. (c) Pouring of metals in moulds (Ferrous and Non-Ferrous).

(D) CLEANING AND INSPECTION: (a) Shaking, cleaning and fettling of casting (At least 2 Casting) (b) (i) Inspection of cast component (visual) and preparing inspection report (At least one report). (ii) Establishing cause of Defects seen (At least one cause).

(E) CASE STUDY OF: At least 2 sand castings produced from sand preparation pattern layout to final finished casting.

Mechatronics Lab

1. Displacement Measurement using Capacitive & inductive Pick –ups.
2. Study of Speed Measurement System: (a) Magnetic Pick-up (b) Stroboscope
3. Study of Load Measurement System Load Cell
4. Measurement of temperature using thermocouple, thermistor and RTD
5. Measurement of displacement using POT, LVDT & Capacitive transducer
6. Torque measurement using torque measuring devices
7. Strain Measurement using strain gauge
8. Frequency to Voltage Converter and vice versa
9. Position and velocity measurement using encoders
10. Study on the application of data acquisition system for industrial purposes

Level 6 (Semester IV)

Mass Production Devices

Unit 1

Tool holders: Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

Unit 2

Locating and clamping devices: Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

Unit 3

Clamping devices: Types, Sketches with nomenclature, Working, Applications

Unit 4

Jigs and fixtures: Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures

Unit 5

Design of Jigs and Fixtures: Steps in designing jigs and fixture for given simple component

Reference Books :

1. Mass Production ,phaidon

Lean and Agile Manufacturing

Unit 1

Introduction-

Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

Unit 2

Waste Identification-

Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

Unit 3

Value stream mapping-

Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

Unit 4

Lean manufacturing tools-

Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

Unit 5

Agile manufacturing-

Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:

1. Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities,Devadasan S.R
2. Learning Agile: Understanding Scrum, XP, Lean, and Kanban,Andrew Stellman, Jennifer Greene

Metal Forming Processes

Unit 1

Rolling

Introduction, Types of rolling, Hot rolling, Two high reversing mill, Three high mill, Continuous mill, Roll bending

Unit 2

Forging

Introduction, Advantages of Forging, Application of Forging, Limitations of Forging, Upsetting, Hollow Forging, Impression die or closed, Methods of Forging, Drop Forging, Press Forging, Hammer and press Forging, Hot bar Forging, Upset Forging

Unit 3

Extrusion

Direct and forward, Sleeve method of direct, Indirect or backward, Impact Extrusion, Tube Extrusion, Stepped Extrusion, Combined forging and Extrusion

Unit 4

Drawing

Wire Drawing, Cupping and Bending, Tube Drawing, Spinning, Hot and cold Spinning Advantages of Metal Spinning

Unit 5

Pipe and Tube Production-

Manufacturing of seamless pipe- Butt welded pipe- Lap welded pipe

Reference Books:

1. Sheet Metal Forming Processes: Constitutive Modelling and Numerical Simulation,D. Banabic
2. Metal Forming Processes ,G. R. Nagpal

Non-conventional Machining

Unit-I
Introduction:
Limitations of conventional manufacturing processes need of unconventional manufacturing processes and its classification.

Unit-II
Un-Conventional Machining Processes:
Principle and working and applications of unconventional machining processes such as Electric Discharge machining (EDM), Electro- Chemical machining (ECM), Ultrasonic Machining (USM), and Abrasive Jet machining (AJM)

Unit-III
Un-Conventional Welding Processes:
Principle and working and applications of unconventional welding processes such as Laser Beam Welding, Electron Beam Welding, Ultrasonic Welding, Plasma Arc Welding processes.

Unit-IV
Explosive Welding:
Cladding etc. Under water welding, Metalizing Theory, Process and applications

Unit-V
Un-conventional forming processes:
Principle and working and applications of high energy forming processes such as Explosive forming, Electromagnetic forming. Electro discharge forming Water hammer forming, Explosive Compaction

Reference Books:
1. Modern Machining Process, P.C. Pandey
2. Un-conventional machining, V.K. Jain

Tool & Die Making Lab

- Manufacture of Box Jig and Angle plate jig
- Manufacture of DzVdz Block angle grinding Fixtures and profile milling fixture
- Manufacture of simple Blanking & piercing Tool
- Manufacture of Progressive tool for producing a Cycle chain link
- Manufacture of Press tools like Combination tool & Compound tool
- Manufacture of Draw tool
- Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup Washer and Cycle bell cup
- Manufacture of simple V and U bending tool
- Maintenance of Jig & fixture and press tool

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 7 (Semester V)
Reliability, Maintenance and Safety Engineering

Unit 1
Reliability
Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit 2
Constant Failure rate model
Exponential Reliability function, Failure Modes, CFR model, memory lessness, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit 3
Design for reliability
Reliability specifications and system measurements, System Effectiveness, redundancy, Classification of Redundancy, Introduction of failure mode and effect analysis (FMEA)

Unit 4
Maintainability
Analysis of Downtime, repair time distribution, stochastic point processes.

Unit 5
Safety engineering
Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives

Reference Books:

1. Reliability Engineering, S.C. Sharma, Khanna Publishing House
2. Reliability, Maintenance and Safety Engineering,A.K. Gupta

Plant Layout & Product Handling

Objective of Facility Design: Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

Computerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.;

Product handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, fork lifters;

Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

Reference Books:

1. Plant Layout and Materials Handling, S. C. Sharma
2. Plant Layout and Materials Handling ,R. B. Choudhary and G. R. N. Tagore

Product Design for Manufacturing

Unit 1

Importance of New Product

Importance of new product for growth of enterprise, Definition of product and new product, Classification of products from new product development point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products

Unit 2

New product development process and organization

Generic product development process for Market Pull and Market Push Products, Need Identification and Analysis, Problem Formulation, establishing economic existence of need, Engineering Statement of Problem, Establishing Target Specification

Unit 3

Generation of Alternatives and Concept Selection

Introduction to Concept generation, Tools of creativity like brain storming, Analogy, Inversion, introduction to Concept feasibility and Concept Selection, Establishing Engineering Specification of Products

Unit 4

Preliminary and Detailed Design

Preliminary design, Identification of subsystems, Subsystem specifications, detailed design of subsystems, component design

Unit 5

Assembly drawing and review

Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics

Reference Books:

1. Manufacturing Processes for Design Professionals, Rob Thompson
2. Product design for manufacture and assembly, Geoffrey Boothroyd

CAD & CAM

Unit 1

Introduction CIM and CAD & Analysis:

CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

Unit 2

Computer aided Manufacturing CAM:

Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

Unit 3

CNC Machine and Components:

CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

Unit 4

Part Programming

NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

Unit 5

FMS, Integrated Material Handling and Robot:

Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House
2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.

CAM Lab

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation

Level 7 (Semester VI)
Rapid Prototyping and Reverse Engineering

Unit 1
Introduction
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Unit 2
CAD Modelling and Data Processing for RP
CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

Unit 3
RP Systems
Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes. Extrusion - Based RP Systems, 3D Printing process modelling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

Unit 4
Rapid Tooling:
Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Unit 5
RP Applications:
Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP

Reference Books:
1. Rapid Product Development (English, Paperback, Kimura Fumihiko

Production Planning and Control

Unit 1

Demand Forecasting

Introduction, components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Selection of forecasting technique.

Unit 2

Capacity Planning

Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.

Unit 3

Facility Location

Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, fixed position, combination and cellular layouts; Designing product and process layout, line balancing.

Unit 4

Production Control

Capacity control and priority control, production control functions; Routing, scheduling, Dispatching, expediting and follow up, Techniques of production control in job shop production, batch production and mass production systems

Unit 5

Sequencing

Priority rules, sequencing methods, sequencing jobs through two work centers, scheduling services, application of CPM and PERT techniques.

Reference Books:

1. Production Planning and Control,W. Bolton
2. Production Planning and Control with SAP,Jörg Thomas Dickersbach and K. Weihrauch

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Industrial Tool Manufacturing(IM)
Branch Code:104
Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Industrial Tool Manufacturing

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV511	Machine Tool Technology		10	5	5	20	30		**50**	**2**
2	BIMV512	General Mechanical Engineering – I	30	10	5	5	20	30		**50**	**2**
3	BIMV513	Manufacturing Technology -I	30	10	5	5	20	30		**50**	**2**
4	BIMV514	Metrology and Measuring Instruments	30	10	5	5	20	30		**50**	**2**
5	BIMP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BIMP512	Machine Tool Technology Lab	30				20		30	**50**	**1**
7	BIMP513	Language Lab	30				20		30	**50**	**2**
8	BIMT511	Metal Arc Welding (CSC/Q0204)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BIMT512	MIG MAG or GMAW Welder (CSC/Q0209)									
	BIMT513	Assistant TIG Welder (CSC/Q0212)									
	BIMT514	CNC Setter Cum Operator (CSC/Q0120)									
	BIMT515	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV521	Total Quality Management	30	10	5	5	20	30		**50**	**2**
2	BIMV522	General Mechanical Engineering – II	30	10	5	5	20	30		**50**	**2**
3	BIMV523	Manufacturing Technology -II	30	10	5	5	20	30		**50**	**2**
4	BIMV524	Industrial Engineering	30	10	5	5	20	30		**50**	**2**
5	BIMP521	Project	30				20		30	**50**	**1**
6	BIMP522	Engineering Graphics	30				20		30	**50**	**1**
7	BIMP523	Mechanical Workshop Practice	30				20		30	**50**	**2**
8	BIMT521	Metal Arc Welding (CSC/Q0204)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BIMT522	MIG MAG or GMAW Welder (CSC/Q0209)									
	BIMT523	Assistant TIG Welder (CSC/Q0212)									
	BIMT524	CNC Setter Cum Operator (CSC/Q0120)									
	BIMT525	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BIMV631	Tool Engineering – I	30	10	5	5	20	30		50	2
2	BIMV632	Production Automation & Computer Integrated Mfg	30	10	5	5	20	30		50	2
3	BIMV633	Fundamentals of Mechatronics	30	10	5	5	20	30		50	2
4	BIMV634	Machining and Machine Tools	30	10	5	5	20	30		50	2
5	BIMH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BIMP631	Tool Engineering Lab	30				20		30	50	1
7	BIMP632	Mechatronics lab – Practical	30				20		30	50	1
8	BIMT631	Service Engineer – Installation (CSC/Q0501)					Any one Training 400 hrs/ 8 weeks			150	12
	BIMT632	Quality Inspector-Forged, Casted or Machined Component (CSC/Q0601)									
	BIMT633	CNC Programmer (CSC/Q0401)									
	BIMT634	Maintenance Fitter – Mechanical (CSC/Q901)									
	BIMT635	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BIMV641	Tool Engineering – II	30	10	5	5	20	30		50	2
2	BIMV642	Agile and Lean Manufacturing Systems	30	10	5	5	20	30		50	2
3	BIMV643	Metal Forming Processes	30	10	5	5	20	30		50	2
4	BIMV644	Mass Production Devices	30	10	5	5	20	30		50	2
5	BIMH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BIMP641	Tool and Die Making Lab - Practical	30				20		30	50	1
7	BIMP642	IT Tool Lab	30				20		30	50	1
8	BIMT641	Service Engineer – Installation (CSC/Q0501)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			150	12
	BIMT642	Quality Inspector-Forged, Casted or Machined Component (CSC/Q0601)									
	BIMT643	CNC Programmer (CSC/Q0401)									
	BIMT644	Maintenance Fitter – Mechanical (CSC/Q901)									
	BIMT645	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			610							500	24

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV751	Reliability, Maintenance & Safety Engineering	30	10	5	5	20	30		**50**	**2**
2	BIMV752	Design Concepts in Engineering	30	10	5	5	20	30		**50**	**2**
3	BIMV753	Product Design and Development	30	10	5	5	20	30		**50**	**2**
4	BIMV754	CAD & CAM	30	10	5	5	20	30		**50**	**2**
5	BIMH751	Indian Constitution / Essence of Indian Tradtional Knowledge	30	10	5	5	20	30		**50**	**2**
6	BIMP751	CAD Lab	30				20		30	**50**	**1**
7	BIMP752	CAM Lab	30				20		30	**50**	**1**
8	BIMT751	Tool & Die Maker (CSC/Q0306)					Any one Training 400 hrs/ 8 weeks			**150**	**12**
	BIMT752	Designer – Mechanical (CSC/Q0405)									
	BIMT753	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			**610**							**500**	**24**

NSFQ Level 7 SEMESTER- VI											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV761	Rapid Prototyping and Reverse Engineering	30	10	5	5	20	30		**50**	**2**
2	BIMV762	Process Planning and Cost Estimation	30	10	5	5	20	30		**50**	**2**
3	BIMH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		**50**	**2**
4	BIMP761	Major Project	180						150	**150**	**6**
5	BIMT761	Tool & Die Maker (CSC/Q0306)				Any one Training (other than 5thsem) 400 hrs/ 8 weeks				**200**	**12**
	BIMT762	Designer – Mechanical (CSC/Q0405)									
	BIMT763	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			**670**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Machine Tool Technology

Unit 1: Centre Lathe

The centre lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Head stock and tail stock, Feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrils, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe.

Unit 2: Shaping, Planing& Slotting Machines

Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

DRILLING & BORING MACHINES: Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

Unit 3: Milling Machines

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks

Unit 4: Grinding Machines

Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing.

BROACHING MACHINES: Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines

Unit 5: Jigs and Fixtures

Object of Jigs and Fixture, Difference between jigs and fixtures, Principle of location, Principle of clamping, Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs-bushes (Fixed, Liner, Renewal, and Slip). Template, Plate jigs. Channel jigs, Leaf jigs, Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures,Welding fixtures

COOLING PROCESS: Cooling and cutting fluids, difference between coolant and cutting fluid, function and action of cutting fluids, Requirement of good cutting fluids, their selection for different materials and operationsAUTOMATION OF MACHINE TOOLS: Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

Reference Books:

1. Production Technology: Jain & Gupta
2. Workshop Technology Vol. II: Hazra&Choudhary

General Mechanical Engineering - I Unit 1:

Strength of Materials & Power Transmission

Stress, strain, elastic constraints, stress in circular shaft subjected to pure torsion only, Riveted and bolted joints.

Unit 2: Shear Force & Bending Moment

Elementary idea of Shear force and bending moment for concentrated, uniformly distributed loads on simply supported beam cantilever and overhanging beam, Simple Shear force and bending moment diagrams, Relationship between shear force and bending moment

Unit 3: Power Transmission: Pulleys, Gears & Shaft

Classification of Pulleys, Types of Belts, Simple calculation of pulley diameter, Classification of Gears, Simple calculation of number of teeth and speed, Power transmission by solid and hollow shaft

Unit 4: Hydraulics & Hydraulic Machines

Properties of fluids, pressure of fluid and its measurement. Flow of fluids, velocity and discharge, Bernoulli's theorem and its application in venturimeter, flow through pipe, head loss due to friction

Unit 5: Water Turbines & Pumps
Capacity & Working of Turbines- Pelton and Reaction, reciprocating and centrifugal pump

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House

Manufacturing Technology –I

Unit 1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).
(B) Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools- Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

Unit 2

(A) Joining of Timber Components for Fabrications Works: Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-simple lap and butt, Mortise, Tenon, Dovetail, Miter &briddle joints.
Metal Fabrication
(B) Metal Shaping-Smithy: (i) Operations involved (concept only) (ii) Tool and equipment used (Names, size, specification for identification only) (iii) Heating and fuel handling equipment (iv) Holding and supporting tools (v) Striking Tools (vi) Cutting tools (vii) Punching & Drifting Tools (viii) Bending Tools and figures (ix) Forming & Finishing Tools (x) Defects Occurring & its remedy

Unit 3

Sheet metal Working-Tools and operation: (1) Operations involved (Names and concept only) (2) Sheet metal joints (3) Tools and equipment used (Name, size, specifications for identification only) (4) Marking tools (5) Cutting and shearing Tools (6) Straightening tool
(7) Striking Tools (8) Holding Tools (9) Supporting Tools (10) Bending tools (11) Punching-Piercing and Drafting tools (12) Burring Tools-Files (13) Defects Occurring & its remedy

Unit 4

(A) Metal Joining During Fabrication-
(a) Permanent Joining: (i) Welding methods (ii) Electric welding
(b) Soldering & Brazing: (i) Its concept, comparison with welding as joining method and classification (ii) Soldering operation (iii) Materials Used (iv) Defects Occurring & its remedy
(B) Riveting- (i) Its comparison with welding as joining method. (ii) Rivets and Materials. (iii) Operation involved (iv) Tools and equipment used (Names, Size, specification and uses)), Elementary knowledge about working of pneumatic, hydraulic and electric riveter. Temporary Joining (Fasteners & their uses), General Idea about temporary fasteners & their uses
(C) Familiarity with the Use of Various Tools Used in Mechanical Engineering Workshop (a)Marking & Measuring Tools (b) Holding Tools (c) Cutting Tools (d) Files (e) Thread Cutting Tools (h) Miscellaneous Tools
They should be shown physically to each student for familiarity.

Unit 5

(A) Protection of Fabricated Structures from Weather:

(a) Painting: Its need, Introduction to methods of painting (classification only) operations involved description steps only, surface preparation materials, tools and equipment used (name, size specification for identification), Brushes-round and flat wire brush, scraper, trowel, spray gun, compressor, defects likely to occur in painting and their remedies

(b) Varnishing & Polishing: Its need, operation involved (description of steps only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish, copal varnish, defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed

(B) Foundry Work:

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Workshop Technology, Vol. I: BS Raghuwanshi3. KaryashalaTakniki: JK Kapoor

Metrology and Measuring Instruments

Unit 1

Introduction: Meaning and scope of metrology in field of engineering, Standards andtypes of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error
PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:

(i) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw and screw nut method, compound gearing and helical spring methods.

(ii) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors.

(i) Principles of Electrical measuring Instruments.

(ii) Principles of Hydraulic and Pneumatic Instruments.

Unit 2:

Comparators

General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

Unit 3:

Surface Finish

Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

Unit 4

Various Types Of Instruments Used For:

1. (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer

2. Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only)

TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

Unit 5

Inspection of Geometrical Errors:

Construction and working of auto collimeter,checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod).

MAINTENANCE OF MEASURING INSTRUMENTS: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:

1. Metrology: RK Jain

2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments

UNIT 1

INTRODUCTION: Meaning and scope of metrology in field of engineering, Standards and types of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS: (a) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw and screw nut method, compound gearing and helical spring methods. (b) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors. (c) Principles of Electrical measuring Instruments. (d) Principles of Hydraulic and Pneumatic Instruments.

UNIT 2:

COMPARATORS General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

UNIT 3:

SURFACE FINISH Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

UNIT 4:

VARIOUS TYPES OF INSTRUMENTS USED FOR: (i) (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer (ii) Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only) TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

UNIT 5

INSPECTION OF GEOMETRICAL ERRORS: Construction and working of autocollimeter, checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod). MAINTENANCE OF MEASURING INSTRUMENTS: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:

1. Metrology: RK Jain
2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments lab.

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto- collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Machine Tool Technology Lab.

(A) MACHINE SHOP

1. (a) Square thread cutting (internal and external) - 2 jobs

   (b) Multi-start thread cutting - 1 job

   (c) Eccentric Turning - 1 job

2. Making utility job - Planner, Shaper, Slotter - 1 job
3. Group work on milling machine involving up & down milling in:

   (a)Gang milling - 1 job

   (b)Spur gear cutting - 1 job

   (c)Helical gear cutting - 1 j

(B) FITTING SHOP

1. To make a cut and cup tool - 1 job
2. To make blank and pierce tool - 1 job
3. To make a male and female fitting jobs - 1 job
4. To grind a lathe/shaper/planer tool - 1 job
5. To make different types of keys - 3 jobs
6. To make complete gauge - 2 jobs

Level 5 (Semester II)

Total Quality Management

1. Introduction, Basic concepts of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5–'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

General Mechanical Engineering - II

Unit 1:

Basics of Thermodynamics

Basic definition of heat, work, Thermodynamic process, parameters of working body and their units, Equation of state, Universal gas constant, Relation between heat capacity and temperature. Determination of quantity of heat

Unit 2:

Laws of Thermodynamics

Elementary concept of laws of thermodynamics, first law and second law, Graphical representation of process, The work of expansion and compression of a gas, Change in the state of ideal gas-Isochoric, Isothermal and Adiabatic process, Carnot-cycle

Unit 3:

IC Engines

External & internal combustion engines, working of diesel and petrol engine, horse power of IC engines

Unit 4:

Steam Generators & Condensers

Construction and working of Babcock & Wilcox boiler, Cochran boiler, Steam condenser & its types

Unit 5: Steam & Gas Turbines

Steam turbine, classification and principle of operation, gas turbine

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House
3. General Mechanical Engineering: Jk Kapoor
4. Mechanical Engineering: Khurmi& Gupta

Manufacturing Technology – II

UNIT I

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Elementary idea of machines used for the above processes.

WELDING: (a) Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding. (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG)

(vi) Tungsten Inert Gas welding (TIG) (vii) Atomic Hydrogen arc welding. (viii) Stud welding. (ix) Laser Beam, Electron Beam welding, Explosion welding (b) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

UNIT 2

WELDING OF SPECIAL MATERIALS: (a) Welding of plastics, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron, shielded metal arc gas welding procedures. (c) Welding of Aluminium, Argon arc and gas welding procedures.

(d) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG, Oxy-acetylene method.

TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods (b) Non-destructive methods-visual, X-ray, Y-ray, Magnetic particles, fluorescent, penetrant and ultrasonic testing.

UNIT 3 & UNIT 4:

FOUNDRY PRACTICE PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility. Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, salvaging of castings, Factors determining soundness of casting.

UNIT 5

FOUNDRY PRACTICE: Elementary idea of special casting Processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi

2. Production Technology, Vol. I: Hazra& Chaudhry

Industrial Engineering

UNIT 1

INSPECTION: Inspection and its objective, Types of inspection, Inspection standards, Duties of inspection foreman QUALITY CONTROL: Concept of quality control, Elements of quality control, quality control groups, objectives of quality control. Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes, Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S (v) TQM system, concept & brief idea only .

UNIT 2:

WORK STUDY Method study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, gang process chart, Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion Study. Principles of human motion economy, Micro-motion study, Memo motion study, Therbligs, left hand and right hand chart.

UNIT 3:

CPM & PERT Introduction to CPM, language of CPM network, Diagram map for CPM chart, arrow diagram method of CPM, Programme Evaluation & Review Technique (PERT) Activity event network (simple manual cases only). Project scheduling with CPM & PERT

UNIT 4:

PLANT LAYOUT General Plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout. Advantages and disadvantages of process layout and product layout, GENERAL: Standardization, sources of standard, value of standardization. Production Planning & Control-Introduction, concept of planning, scheduling routing &dispatching and follow up functions, Need for Production, Planning and Control.

UNIT 5:

MATERIAL HANDLING Material Handling & material handling equipment, factors in material handling problems, cost reduction through improved material handling, Reduction in time of material handling, Material handling equipment-Idea about lifting lowering devices, Transportation devices, combination devices, Maintenance of material handling equipment.

Reference Books:

1. Industrial Engineering and Management, S.C. Sharma, Khanna Publishing House
2. Industrial Safety, S.C. Sharma, Khanna Publishing House
3. Industrial Engineering & Management: Banga, Sharma & Agrawal
4. Industrial Engineering Safety & Pollution (Hindi): HemendraDutt

Project

On the basis of learning in the vocational diploma, a project to be taken up by the student strengthening his/ her vocational skills

Engineering Graphics

1. Introduction

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP.Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2. Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

3. Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of Tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut Spheres.

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.
5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (Semester III)

Tool Engineering - I

Unit 1

Introduction:

Concept, meaning and definitions of tool, tool design and tool engineering, Tools-types, classification, features & applications, Tool engineering- functions and importance to enhance productivity and quality, Importance of process planning in tool engineering, Economy-concept, meaning, importance and principles in tool engineering.

Unit 2

Cutting tools: Cutting tool materials-types, composition, properties and applications, Carbide inserts-types, ISO-designation and applications, Re-sharpening methods of following cutting tools: i. Drill. ii. Side and face milling cutter. iii. End mill. iv. Centre drill etc.

Unit 3

Press tools: Press working processes-types, sketches and applications, Press tools: types, working, components and their functions, Concept, meaning, definitions and calculations of press tonnage and shut height of press tool, Shear action in die cutting operation, Centre of pressure: Concept, meaning, definition, methods of finding and importance, Die clearance: Concept, meaning, definition, reasons, effects and methods of application, Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization, Types, working, and applications of stock stop, pilots, strippers and knockouts, Cutting dies-types and applications.

Unit 4

Dies and moulds: Bending: Types, Parts and functions of bending die, Definition, calculations and factors affecting bend radii, bend allowance and spring back, Method to compute bending pressure, Types, sketch, working and applications of bending dies. Drawing dies-types and method to determine blank size for drawing operation, Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging), Forging dies- terminology, types, sketch, working and applications, Dies / Mould: Sketch, working and applications of following i. Extrusion. ii. Plastic injection. iii. Blow moulding

Reference Books:

1. Tool Engineering ,Albert A Dowd

Production Automation & Computer Integrating Manufacturing

UNIT 1-General: Automation-Definition, Scope, its types and their merits, reasons for automation, its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM) Relationship between CIM and Automation FUNDAMENTALS OF MANUFACTURING AND AUTOMATION: Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production).Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control

UNIT 2 -Production Concept: Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing. PRODUCTION ECONOMICS: Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process.

UNIT 3Assembly System And Line Balancing:The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line AUTOMATED ASSEMBLY SYSTEMS: Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines, Analysis of single station assembly machines

UNIT 4:

Numerical Control Production System:Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS

UNIT 5

N.C. Part Programming: Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part programming using CAD/CAM and Computer automated part programming. DNC, CNC & ADAPTIVE CONTROL: Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System)

Reference Books:

1. Numerical Control Machines: NK Mehta
2. Production Automation & Computer Integrated Manufacturing: MP Groover

Fundamentals of Mechatronics

1. Introduction: Introduction to mechatronics, systems, measurement systems, control systems, the mechatronics approach. Introduction to Transducers: Sensors and transducers, operating characteristics of transducers, measurement of displacement, velocity, pressure, flow, and temperature.

2. Signal conditioning: Signal conditioning- their features and various blocks, the operational amplifiers, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing. Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition system, Telemetry- electrical, optical and pneumatic methods of telemetry.

3. Introduction to process control systems: Importance of process control, analog and digital processing, Supervisory digital control, direct digital control. Controller Characteristics: Process characteristics, control system parameters, Discontinuous controller modes (two position, multiple position, floating position), Continuous controller modes i.e. P, I, D, PI, PD, PID.

4. Introduction of Mechanical Actuation Systems: Mechanical Actuation Systems for motion, Kinematics chains, Cams, Gear trains, Belt and chain drives, Bearings. Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Process control valves, rotary actuators.

5. Introduction of Electrical Actuation Systems: Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors.

Reference Books:

1. Mechatronics: A Multidisciplinary Approach,by William Bolton
2. Mechatronic Systems: Fundamentals,by R. Isermann

Machining and Machine Tools

1. Classification of Metal Removal Process and Machines Mechanics of Metal Cutting: Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS, NRS and interrelationship, introduction of mechanism of chip formation and types of chips, chip breakers, orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface temperature, friction in metal cutting.

2. Machinability: Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability, Cutting fluids, types, properties, selection and application methods, General Purpose Machine Tools: tooling, attachments and operations performed, selection of cutting parameters, Simple calculation of time for machining.

3. Special Purpose Machine Tools: Automatic lathes, capstan and turret lathe machines, tracer attachment in machine tools, mechanical-copying machines, Hydraulic tracing Devices, Electric tracing systems, Automatic tracing, Abrasive Processes: Abrasives, natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding, machines for surface and cylindrical grinding, their constructional details and processes, surface finishing, honing, lapping, super finishing, polishing and buffing processes.

4. Thread and Gear Manufacturing: Casting, thread chasing, thread cutting on lathe, thread rolling, die threading and tapping, thread milling, thread grinding, Gear Manufacturing Processes: Hot rolling, stamping, powder metallurgy, extruding etc. gear generating processes, gear hobbling, gear shaping, gear finishing processes, shaving, grinding, lapping, shot blasting, phosphate coating, gear testing.

5. High Velocity Forming Methods: (High-energy rate forming processes) Definition, Hydraulic forming, explosive forming, electro- hydraulic forming, magnetic pulse forming

Reference Books:

1. Machine Design, Sadhu Singh, Khanna Publishing House
2. Machine Design Data Book, Sadhu Singh, Khanna Publishing House

Tool Engineering Lab

1. Study of the influence of tool geometry on surface integrity

a. With positive rake angle b. With negative rake angle

2. Effect of speed, feed, depth of cut and nose radius on surface topography of the components machined using tool inserts

3. Cutting force measurement and construction of Merchant circle diagram as a function of rakeangle

4. Study of different type of chips

5. Tool tip temperature measurement during turning of heat treated and cast products

6. Machinability studies on different materials (for different conditions)

7. Machining of the heat treated samples

8. Machining of as-cast product

9. Measurement of tool wear of inserts due to machining

Mechatronics Lab

1. Displacement Measurement using Capacitive & inductive Pick –ups.
2. Study of Speed Measurement System: (a) Magnetic Pick-up (b)Stroboscope
3. Study of Load Measurement System Load Cell
4. Measurement of temperature using thermocouple, thermistor and RTD
5. Measurement of displacement using POT, LVDT & Capacitive transducer
6. Torque measurement using torque measuring devices
7. Strain Measurement using strain gauge
8. Frequency to Voltage Converter and vice versa
9. Position and velocity measurement using encoders
10. Study on the application of data acquisition system for industrial purposes

Level 6 (Semester IV)

Tool Engineering – II

Unit 1.

Tool holders: Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

Unit 2.

Locating and clamping devices: Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

Unit 3.

Clamping devices: Types, Sketches with nomenclature, Working, Applications

Unit 4.

Jigs and fixtures: Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures.

Unit 5.

Design of Jigs and Fixtures: Steps in designing jigs and fixture for given simple component

Reference Books:

1. Tool Engineering BY Albert A Dowd

Lean and Agile Manufacturing

Unit 1.

Introduction- Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

Unit 2.

Waste Identification- Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

Unit 3.

Value stream mapping- Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

Unit 4.

Lean manufacturing tools- Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

Unit 5.

Agile manufacturing- Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:

1. Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities,Devadasan S.R
2. Learning Agile: Understanding Scrum, XP, Lean, and Kanban,Andrew Stellman, Jennifer Greene

Metal Forming Processes

Unit 1.

Rolling- Introduction, Types of rolling, Hot rolling, Two high reversing mill, Three high mill, Continuous mill, Roll bending

Unit 2.

Forging- Introduction, Advantages of Forging, Application of Forging, Limitations of Forging, Upsetting, Hollow Forging, Impression die or closed, Methods of Forging, Drop Forging, Press Forging, Hammer and press Forging, Hot bar Forging, Upset Forging

Unit 3.

Extrusion- Direct and forward, Sleeve method of direct, Indirect or backward, Impact Extrusion, Tube Extrusion, Stepped Extrusion, Combined forging and Extrusion

Unit 4.

Drawing- Wire Drawing, Cupping and Bending, Tube Drawing, Spinning, Hot and cold Spinning Advantages of Metal Spinning

Unit 5.

Pipe and Tube Production- Manufacturing of seamless pipe- Butt welded pipe- Lap welded pipe

Reference Books:

1. Sheet Metal Forming Processes: Constitutive Modelling and Numerical Simulation,D. Banabic
2. Metal Forming Processes ,G. R. Nagpal

Mass Production Devices

Unit 1.

Introduction- Properties of tool material, types of tool material, 5 basic requirement of tool material and general consideration in tool design, Tools-types, classification, features & applications

Unit 2.

Design of Cutting Tools- Geometry and features of Single point tool, Boring tool, Twist Drill, Milling cutter, Broaches.Carbide inserts-types, ISO-designation and applications.

Unit 3.

Press Tools- Introduction to Press tools, Elements of press tools - punches, punch holder, knockouts, pilots stock, Types of punches, Standards die sets, Element of blanking die, Element of drawing die, Element of bending die, Working of progressive and compound dies

Unit 4.

Jig & Fixtures-I- Usefulness, Principles of Jig & Fixtures design, Principle of location, Locating and clamping devices 5. Jig & Fixtures-II- Type of jigs, Element of a fixture, Milling fixtures, Lathe fixture, Economics of jigs and fixtures

Reference Books:

1. Mass Production, phaidon

Tool & Die Making Lab

1. Manufacture of Box Jig and Angle plate jig
2. Manufacture of “V” Block angle grinding Fixtures and profile milling fixture
3. Manufacture of simple Blanking & piercing Tool
4. Manufacture of Progressive tool for producing a Cycle chain link
5. Manufacture of Press tools like Combination tool & Compound tool
6. Manufacture of Draw tool
7. Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup, Washer and Cycle bell cup
8. Manufacture of simple V and U bending tool
9. Maintenance of Jig& fixture and press tool

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 7 (Semester I)

Reliability, Maintenance and Safety

Engineering

Unit 1

Reliability- Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit 2

Constant Failure rate model- Exponential Reliability function, Failure Modes, CFR model, memory lessens, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit 3

Design for reliability- Reliability specifications and system Measurements, System Effectiveness, redundancy, Classification of Redundancy. Introduction of failure mode and effect analysis (FMEA)

Unit 4

Maintainability- Analysis of Downtime, repair time distribution, stochastic point processes.

Unit 5

Safety engineering- Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives.

Reference Books:

1. Reliability Engineering, S.C. Sharma, Khanna Publishing House
2. Reliability, Maintenance and Safety Engineering,A.K. Gupta

Design Concepts in Engineering

1. Design Fundamentals: Importance of design- The design process-Considerations of Good Design – Morphology of Design –Organization for design– Computer Aided Engineering – Designing to codes and standards – Concurrent Engineering – Product and process cycles – Technological Forecasting – Market Identification – Competition Bench marking.

2. Customer Oriented Design & Societal Considerations: Identification of customer needs- customer requirements- Quality Function Deployment- Product Design Specifications- Human Factors in Design – Ergonomics and Aesthetics. Societal consideration - Contracts – Product liability – Protecting intellectual property – Legal and ethical domains – Codes of ethics - Ethical conflicts – Environment responsible design-future trends in interaction of engineering with society.

3. Design Methods: Creativity and Problem Solving –Creativity methods-Theory of Inventive Problem Solving (TRIZ)–Conceptual decomposition-Generating design concepts-Axiomatic Design – Evaluation methods-Embodiment Design-Product Architecture-Configuration Design- Parametric Design. Role of models in design-Mathematical Modelling – Simulation – Geometric Modelling –Rapid prototyping-Finite Element Analysis– Optimization – Search Methods

4. Material Selection Processing and Design: Material Selection Process – Economics – Cost Vs Performance – Weighted property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design for Manufacture – Design for Assembly–Designing for castings, Forging, Metal Forming, Machining and Welding – Residual Stresses – Fatigue, Fracture and Failure.

Reference Books:

1. Design concepts for engineers,Mark N. Horenstein
2. Concepts in Engineering Design,Sumesh Krishnan, Dr.Mukul Shukla

Product Design and Development

Unit 1.

Importance of New Product: Definition-importance-Development Process, Importance of new product for growth of enterprise, Definition of product and new product, Responsibility for new product development, Demands on product development team, Classification of products from new product development point of view. New product development process and organization, Generic product development process for Market Pull Products, Modification of this process for other types of products.

Unit 2.

Need Analysis: Problem formulation establishing economic existence of need, need identification and analysis, engineering statement of problem, establishing target specification

Unit 3.

Generation of Alternatives and Concept Selection: Concept generation- a creative process, Creativity, Road Elects to creative thinkingFear of criticism and Psychological set, Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process, Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.

Unit 4.

Preliminary and Detailed Design: Design Review Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility, Detailed design of subsystems, component design, Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.

Unit 5

Assembly drawing and review
Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics

Reference Books:

1. Manufacturing Processes for Design Professionals, Rob Thompson
2. Product design for manufacture and assembly, Geoffrey Boothroyd

CAD & CAM

Unit 1

Introduction CIM and CAD & Analysis:

CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

Unit 2

Computer aided Manufacturing CAM:

Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

Unit 3

CNC Machine and Components:

CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

Unit 4

Part Programming

NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

Unit 5

FMS, Integrated Material Handling and Robot:

Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House

2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.

CAM Lab

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation

Level 7 (Semester VI)

Rapid Prototyping and Reverse Engineering

Unit 1

Introduction

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Unit 2

CAD Modelling and Data Processing for RP

CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

Unit 3

RP Systems

Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes. Extrusion - Based RP Systems, 3D Printing process modelling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

Unit 4

Rapid Tooling:

Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Unit 5

RP Applications:

Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP

Reference Books:

1. Rapid Product Development, Kimura Fumihiko

Process Planning and Cost Estimation

Unit 1. Introduction to Process Planning: Process Planning—Definition, Purpose of Process Planning, Concept of Process Planning, Objectives of Process Planning, Scope of Process Planning, and Information required to do Process Planning, Preparing Operation Planning Sheet

Unit 2. Process Planning activities: Process Planning Procedure, Approaches of Process Planning, Manual Process Planning, Computer Aided Process Planning, Factors Affecting Selection Process, Machine Capacity, Determination of Man, Machine and Material Requirements, Factors Influencing Choice of Machinery

Unit 3. Introduction to Cost Estimation: Reasons for doing Estimates, Importance of Estimating, Objectives or Purpose of Estimating, Functions of Estimating, Cost Accounting of Costing, Importance of Costing, Aims of Cost Accounting, Difference between Cost Estimating and Cost Accounting, Cost of Product (Ladder of Cost) Production Cost Estimation, Determination of Material Cost, Mensuration in Estimating

Unit 4. Machining Time Calculation: Selection of Cutting Speed, Feed and Depth of Cut for Turning: Machining Time Calculation for Turning Operation. Selection of Cutting Speed, Feed and Depth of Cut for Milling Operation: Machining Time Calculation for Milling Operation. Selection of Cutting Speed, Feed Depth of Cut for Drilling Operation: Machining Time Calculation for Drilling Operation

Reference Books:

1. Process Planning And Cost Estimation,Panneerselvam R., Sivasankaran P.
2. Process Planning and Cost Estimation, B. Vijayaramanath, C.Elanchezhian, R.Kesavan

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc

Refrigeration and Air conditioning(RC)

Branch Code:105

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme
B. Voc Refrigeration and Air conditioning

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV511	Basics of Refrigeration	30	10	5	5	20	30		50	2
2	BRCV512	Basics of Air Conditioning	30	10	5	5	20	30		50	2
3	BRCV513	Engineering Material	30	10	5	5	20	30		50	2
4	BRCV514	Soldering & De-Soldering of Components & Emergency actions	30	10	5	5	20	30		50	2
5	BRCP511	Metrology and Measuring Instruments Lab	30				20		30	50	1
6	BRCP512	Heat Transfer lab.	30				20		30	50	1
7	BRCP513	Language Lab	30				20		30	50	2
8	BRCT511	Field Technician- AC (ELE/Q 3102)						Any one Training 400 hrs/ 8 weeks		150	12
	BRCT512	Field Technician- Refrigeration (ELE/Q 3103)									
	BRCT513	Field Engineer- RACW (ELE/Q3105)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV521	Industrial Management	30	10	5	5	20	30		50	2
2	BRCV522	Total Quality Management	30	10	5	5	20	30		50	2
3	BRCV523	Entrepreneurship	30	10	5	5	20	30		50	2
4	BRCV524	Refrigeration & Air Conditioning Applications	30	10	5	5	20	30		50	2
5	BRCP521	Project -1	30				20		30	50	1
6	BRCP522	Basic Electrical and Electronics Lab	30				20		30	50	1
7	BRCP523	IT Tools Lab	30				20		30	50	2
8	BRCT521	Field Technician- AC (ELE/Q 3102)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		150	12
	BRCT522	Field Technician- Refrigeration (ELE/Q 3103)									
	BRCT523	Field Engineer- RACW (ELE/Q3105)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV631	RAC Piping Systems - I	30	10	5	5	20	30		50	2
2	BRCV632	Refrigeration & Air-conditioning Material -I	30	10	5	5	20	30		50	2
3	BRCV633	Refrigerants	30	10	5	5	20	30		50	2
4	BRCV634	RAC Standards	30	10	5	5	20	30		50	2
5	BRCH631	Uni. Human Values & ethics/Env. &Eco.	30	10	5	5	20	30		50	2
6	BRCP631	RAC Material Lab	30				20		30	50	1
7	BRCP632	RAC Systems Installation and its Maintenance Lab. - I	30				20		30	50	1
8	BRCT631	Safety Tester – RACWO (ELE/Q3605)					Any one Training 400 hrs/ 8 weeks			150	12
	BRCT632	Field Engineer – RACW (ELE/Q3105)									
	BRCT633	Cold Storage Technician (FIC/Q7004)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV641	RAC Piping Systems - II	30	10	5	5	20	30		50	2
2	BRCV642	Refrigeration & Air-conditioning Material-II	30	10	5	5	20	30		50	2
3	BRCV643	RAC Maintenance - I	30	10	5	5	20	30		50	2
4	BRCV644	RAC Installation Techniques - I	30	10	5	5	20	30		50	2
5	BRCH641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BRCP641	RAC Systems Installation and its Maintenance Lab. - II	30				20		30	50	1
7	BRCP642	RAC Piping Systems Lab	30				20		30	50	1
8	BRCT641	Safety Tester – RACWO (ELE/Q3605)					Any one Training (other than 3rd sem) 400 hrs/ 8 weeks			150	12
	BRCT642	Field Engineer – RACW (ELE/Q3105)									
	BRCT643	Cold Storage Technician (FIC/Q7004)									
Total			610							500	24

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV751	RAC Maintenance - II	30	10	5	5	20	30		50	2
2	BRCV752	RAC Installation Techniques - II	30	10	5	5	20	30		50	2
3	BRCV753	Automobile Air conditioning	30	10	5	5	20	30		50	2
4	BRCV754	Non-conventional Refrigerating System	30	10	5	5	20	30		50	2
5	BRCH751	Indian Constitution / Essence of Indian Traditional knowledge	30	10	5	5	20	30		50	2
6	BRCP751	RAC Maintenance - II	30				20		30	50	1
7	BRCP752	RAC Installation Techniques - II	30				20		30	50	1
8	BRCT751	AC Specialist – Automobile (ASC/Q 1416)					Any one Training 400 hrs/ 8 weeks			150	12
	BRCT752	Assembly Operator (ELE/ Q 3501)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV761	RAC Safety	45	10	5	5	20	30		50	2
2	BRCV762	Process Planning and Cost Estimation	45	10	5	5	20	30		50	2
3	BRCH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BRCP761	Major Project	180						150	150	6
5	BRCT761	AC Specialist – Automobile (ASC/Q 1416)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BRCT762	Assembly Operator (ELE/ Q 3501)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester 1)

Bridge Course

Steam Generators: Types of steam generators - Fire tube, water tube boilers, boiler mountings and accessories, Equivalent evaporation, boiler efficiency, elements of power plant.

Reciprocating Steam Engines: Working principles, classification, a brief idea and concept only.

Steam Turbines: Classification, principle of operation of Impulse reaction steam turbines.

Steam Condensers: Principle of operation, classification, a brief concept, condenser details, applications

Air Compressors: Definition and their use, Difference between reciprocating and rotary compressors, their types and working, Inter cooling in two stage compression volumetric efficiency, Compressor lubrication. Simple numerical problems.

Basic Thermodynamics: Definition, concept of thermodynamic system and surroundings, closed system, open system, isolated system thermodynamics, definition of work, Zeroth law of thermodynamics, First law of thermodynamics for cyclic and noncyclical processes, Idea of internal energy and enthalpy, Applicability of first law on various thermodynamics processes, simple numerical problems.

Steady state flow process, its equation and its applications: Second law of thermodynamics, Thermodynamics concept of perpetual motion machine of first order and that of second order, Concept of heat engine, heat pump and refrigerator, Carnot cycle efficiency for heat engine and C.O.P for refrigerator and heat pump, Entropy: Its physical concept and significance.

Basics of Refrigeration

Unit 1

INTRODUCTION: Its meaning and application, unit of refrigeration; Various methods of refrigeration.

Unit 2

REFRIGERATION SYSTEMS: Refrigeration Cycles: Refrigeration, carnot cycle of refrigeration (ideal cycle), Bell-Coleman cycle of refrigeration, their COP and Conditions for its highest value, Temperature limitations. Representation of these cycles, in P-V, T-S and P-H diagrams and also their flow diagrams, Simple numerical problems .

Unit 3

Vapour compression system: Standard vapour compression cycle, wet and dry compression, Effect of sub cooling and super heating, Effect of temperature and pressure on COP of the cycle. Simple numerical problems with the help of P-H diagram. Concept of house hold refrigerator working on vapour compression cycle.

Unit 4

Vapour Absorption System: Cycle of operation, Construction and working of refrigerator based on this system. Simple numerical problems (Simple line diagram)

Unit 5

REFRIGERANTS: Definition, classification & properties of few important refrigerants such as Ammonia, Sulphur-Di-Oxide (SO_2) Carbon-Di-Oxide (CO_2) Freon -12 (F-12) F-11. Qualities of good refrigerants, secondary refrigerant .

Suggested Reading:

Refrigeration and Air Conditioning: A Sarao

Refrigeration and Air Conditioning: RS Khurmi

Basics of Air Conditioning

Unit 1

INTRODUCTION: Its meaning and general application. Psychrometry: Definition, Composition of air, Daltons law of partial pressure, Gas and Vapour mixture, Dry and Wet bulb temperature, Wet bulb depression, Dew point, Dew point depression, Saturated air,

Unit 2

Specific humidity, Degree of saturation, Relative humidity, Absolute humidity, Humid specific volume and humid specific heat, Enthalpy of moist air,

Unit 3

Use of psychometric charts and tables, Sensible heating and cooling, Humidification and dehumidification and their methods, Simple numerical problems concerning above

Unit 4

HEAT LOAD: Brief idea of various types of heat loads, Sensible and latent heat loads. Sensible hat factor

Unit 5

ROOM AIR CONDITIONING: Brief idea of room air conditioning, Window types packaged air conditioner. Central air conditioning system, Round the year air conditioning

Suggested Reading:

Refrigeration and Air Conditioning: A Sarao
Refrigeration and Air Conditioning: RS Khurmi

Engineering Material

UNIT 1

ELECTRICAL ENGINEERING MATERIALS

Conducting Materials: Properties of good conducting materials, Brief idea about conductivity & Resistivity

UNIT 2

(a) Insulating Materials: (a) Plastic insulating materials-definition and classification, thermo-setting and thermoplastic materials, their applications and commercial names & uses in industry. (b) Various insulating materials-mica asbestos, ceramic materials, glass, cotton, silk, jute, paper their properties and applications

(B) Semiconductor Materials: Characteristics and applications of semiconductor materials

UNIT 3

(A) Non-Metallic Materials-Timber. Preservation of timber, Defects of timber, Surface treatment, Plywood, Hard Board, Batten Board, Veneer board, units of purchase

(B) Miscellaneous Materials: Important properties, characteristics and use of the following materials: Abrasives, Asbestos, Celluloid, Cork, Mica, Refractory

UNIT 4:Mechanical Engineering Materials

Non-Ferrous Metals: Aluminium, Zinc, Copper, Tin, Silver, Lead - Trade names; Physical, mechanical, and electrical properties and use

(ii) Base metal with principal alloying elements - Aluminium Alloys, Copper Alloys, Nickel Alloys, Bearing Metals- Lead base alloys, Tin base alloys, (White metals or babbitt metals), Copper base alloys.

UNIT 5: Civil Engineering Materials

General idea of raw materials, properties and uses of Bricks, lime, cement

Foundation: (i) Bearing capacity of soil and its importance, need of foundation for machines (ii) Foundations for heavy, light and vibrating machines (iii) Concrete proportion, mixing w/c ratio, workability RCC and its use.

Suggested Reading:

Engineering Materials: DhanpatRai& Sons

Electrical Engineering Materials: Madan Publishers

Soldering & De-soldering components & Emergency actions

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

2. Introduction to SMD Components
   - Identification of 2, 3, 4 terminal SMD components
   - Soldering the SMD components on the PCB
   - Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
   - Identify various connections and the setup required for SMD soldering station
   - De solder the SMD components from the given PCB
   - Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
   - Make a panel board using different types of switches for a given application
   - Identification of crimping tools for various IC packages
   - Reliable Soldering Practices

3. Emergency actions
   - Minimum Requirements

Metrology and Measuring Instruments lab.

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto-collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters

Heat Transfer Lab.

Experiments on Conduction

1. Determination of Thermal conductivity of insulation powder
2. Determination of overall heat transfer coefficient of Composite Wall
3. Determination of overall heat transfer coefficient of Lagged Pipe
4. Determination of Thermal Conductivity of given Metal Rod

Experiments on Convection

5. Determination of heat transfer coefficient of Pin-Fin (Natural and Forced Convection)
6. Determination of heat transfer coefficient of Natural Convection
7. Determination of heat transfer coefficient of Forced Convection.

Experiments on Radiation

8. Determination of Stefan Boltzman Constant
9. Determination of Emissivity of test plate

Experiments on Applications of heat transfer and heat transfer with phase change

10. Determination of effectiveness and overall heat transfer coefficient using Parallel and Counter flow Heat Exchanger
11. Determination of heat transfer coefficient in drop and film wise condensation
12. Determination of Critical Heat flux
13. Study of heat pipe and its demonstration

Level 5 (Semester II)

Industrial Management

Unit -1. Introduction:

Growth of industry, The management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

Unit-2. Private sector and public sector:

Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit-3. Wages & incentives:

Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.

Unit-4.Labour, industrial & tax laws:

Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit-5. Material management:

Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards

Total Quality Management

Unit-1. Introduction, Basic concepts

of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

Unit-2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5 –'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

Unit-3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

Unit-4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban& 2 Bin Systems

Unit-5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Entrepreneurship

Unit 1. Entrepreneurship

and entrepreneur:

Need of Employment and Opportunities, Essential Characteristics of a good Entrepreneur, Industrial Policy, Classification of industries- Micro, small scale , Medium scale, Large scale, Type of industries- Production, Job based & Service

Unit 2. Entrepreneurial Development:

Product identification/ selection, Site selection, Plant layout, Institutional support needed, Pre-market survey.

Unit 3. Entrepreneurship Support System and Start-ups:

Introduction to start-up's, Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMML, Role of state finance corporation, state electricity corporations, pollution control board, BIS, I.S.O. etc.

Unit 4. Introduction to Tax System, Insurance and Acts:

Idea of income tax, sales tax, excise duty and custom duty, Industrial and fire insurance, procedure for industrial insurance, Introduction to Industrial acts, factory act, Workmen's compensation act 1923, Apprentices act 1961, Environmental protection act 1986.

Unit 5. Project Report Preparation:

Procedure of preparing a project report, Format of project report, Preparation of project report, Introduction to ISO: 9000 Series of Quality System

Refrigeration & Air Conditioning Applications

Unit I: Food Preservation

Introduction, factors contributing to food spoilage, causes of food spoilage, methods of food preservation, freezing method of food preservation, preservation of food with direct contact of liquid N2, freeze drying, preservation of different products, cold storage and commercial cabinets.

Unit II: Commercial Applications

Introduction, air-conditioning of houses, offices, hotels and restaurants, air-conditioning ofdepartmental stores, air-conditioning of theatres and auditoriums, hospitals and medical applications

Unit III: Ice-Manufacturing

Introduction, principles of ice production, different methods of ice manufacturing, treatment of water for making ice, brines, freezing tanks, ice cans, quality of ice

Unit IV: Industrial Applications

Introduction, importance of RH in different industries, ice-cream manufacturing, refrigeration for breweries, selection of refrigerant for breweries, use of liquid N2 for fabric, quality, air conditioning in textile and photographic industries

Unit V: Transport Air Conditioning

Introduction, automobile air conditioning, railway air-conditioning, marine air conditioning, aircraft air conditioning

Recommended books:

1. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
2. course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi

Reference books:

1. Refrigeration and Air Conditioning by C.P.Arora, McGraw Hill education (India) (P) limited, New Delhi
2. Principles of Refrigeration by Roy J. Dossat, Pearson education, New Delhi

Project -1

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Basic Electrical and Electronics Lab

Basic Electrical – Practicals

Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross- sectional area of the conductor.

2. Verification of Ohm's Law.
3. Verification of temperature co-efficient of resistance:
(i) Positive for Tungsten and Nichrome and
(ii) Negative for carbon.
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
8. To find heat efficiency of an electric kettle.
9. Charging and Discharging of a capacitor.
10. Verification of magnetic field of a Solenoid with:
(i) Iron core and
(ii) Air core.
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field.
13. Study of R.L. series circuit and measurement of power and power factor.
14. Study of R.C. series circuit and measurement of power and power factor.
15. Study of R.L.C. series circuit and measurement of power and power factor.
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q- Factor.

Basic Electronics – Practicals

1. Study of current and voltage measurement using Ammeter and Voltmeter.
2. Study of current and voltage measurement using Galvanometer.
3. Study of current, voltage and resistance measurement using of Multi-meter
4. Study of Power and Energy measurement using Wattmeter and Energy meter.
5. Study of working principle of Signal Generator and measurement of amplitude, time period and frequency of signal using Oscilloscope.
6. Study of V-I Characteristic of Diode.
7. Study of V-I Characteristic of Zener Diode. And use of Zener Diode as voltage regulator.
8. Study of Half wave rectifier with and without filter circuit.
9. Study of Full wave rectifier with and without filter circuit.
10. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
11. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
12. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.
13. Study of working of single layer PCB manufacturing
14. Study of working of double layer PCB manufacturing.
15. Design of 7 segment display using LED and bread board.

Instruments Required (Electrical)

- Trainer kit for verifying ohm's law,
- Trainer kit for measuring TCR
- Lead acid battery,
- Hydrometer,
- Electric kettle
- Trainer kit for measuring power and power factor in RLC circuits

Instruments Required (Electronics)

- Ammeter
- Voltmeter,
- Multi-meter,
- Galvanometer,
- Energy Meter,
- CRO,
- Diode Trainer kit
- Zener diode Trainer kit
- Rectifier trainer kit
- Transistor characteristics trainer kit,
- PCB manufacturing Lab
- Bread board trainer kit to design 7 segment displays.

Level 6 (Semester III)

RAC Piping Systems – I

Bridge Course
Basic understanding Engineering Drawing

Unit I
Codes, Standards and Specifications: Piping codes, ASME codes and standards, ASTM Specifications,

Unit II
ASME Boiler, Pressure vessel codes, ASME B31-Code for pressure piping, mechanical strength, testing of piping system and valves, fabrications.

Unit III
Piping Components: Pipe-seamless, welded pipes, pipe sizes, dimensional specifications, material, specifications, pipe ends, pipe fittings, pipe support,

Unit IV
valves–gate valve, globe valve, check valve, ball valve, plug valve, butterfly valve, control valve, pressure relief valve, valve, codes and standard, valve size, pressure class rating.

Unit V
Viscosity, Reynolds number, friction factor, Darcy Weisback friction factor, friction factor for laminar and turbulent flows, equivalent pipe length, hydraulic radius, compressible, flow,

Recommended Books

1. Piping and Pipeline Calculations Manual by J. Phillip Ellenberger
2. The fundamentals of piping design by Peter Smith.

Reference Books:

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore.
2. ASHRAE handbook, 2002

Refrigeration & Air-conditioning Material – I

Unit I

Introduction, desired properties of ideal insulating material, factors effecting the thermal conductivity,

Unit II

types of insulating material., reflective insulating blinds, laprock – a thermal acoustic and fire insulation, natural insulator, new transparent heat insulator, heat transfer through insulation used for A.C,

Unit III

thickness of insulation, few insulated systems, low temperature insulations, importance of relative humidity for the selection of the insulations, air distribution for reducing heat lose.

Unit IV

Cables and Wiring: Cryocables, economics of cryocables, A.C. super conducting cables, liquid N2 cooled cables, Liquid H2 cooled cables, super magnet, electric generator, minimal insulated cables, installing cables

Unit V

Component Material: Refrigeration component material, duct material, material used in evaporator, material used in compressor, material used in condenser.

Refrigerants

Unit I

Introduction: Refrigerants, cooling media and liquid absorbents, azeotropic and zeotropic, numbering of refrigerants.

Unit II

Classification and Properties of Refrigerants: Requirement for refrigerant, classification-based on working principle, safety and chemical composition, desirable properties of refrigerants-thermodynamic properties, safe working properties, physical properties etc

Unit III

Choice of Refrigerant: Important refrigerants, secondary refrigerant, anti-freeze solution, selection of refrigerant for required purpose,

Unit IV

Application of Refrigerants: refrigerant oils and applications, Properties and uses of commonly used refrigerant

Unit V

Greenhouse effect, Global warming, Future Refrigerants like Hydrofluoro-Olefines

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi

Reference books

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore
2. Refrigeration and Air Conditioning by P.L.Ballaney, Khanna publishers, New Delhi

Modern Refrigeration and Air Conditioning by Andrew D. Althouse, Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC

RAC Standards

Unit I

Introduction: Meaning of IS, need of IS, international classification of standards for refrigeration and air conditioning, various national and international standards for heating, ventilation and air conditioning

Unit II

Procedure of standard development, levels of standard, main standardization, organizations, i.e. ISO-international organization for standardization, IEC-international electro technical commission and others international and national organizations

Unit III

Existing Standards: Main technical standards relevant to HCFC phase-out and low GWP (Global Warming Potential) alternatives, ISO, IEC, ECS (European Committee for Electrical Technical Standardization)

Unit IV

Adoption of International Standards at National Level: National standardization bodies, national ozone units, accreditation bodies, national RAC associations, the process of adoption

Unit V

Use of International Standards: In designing of refrigeration and air conditioning equipment, selection of materials related to refrigeration and air conditioning, safety issues related to refrigeration and air conditioning, industrial and field applications.

Recommended books

1. International Standards in Refrigeration and Air Conditioning , UNEP (United Nations Environment Program)
2. Refrigeration and Air Conditioning data book, New Age International Publication

Reference books

1. ISHRAE standard book for Refrigeration and Air Conditioning
2. ASHRE hand book for Refrigeration and Air Conditioning

RAC Materials Lab

Any eight of the following practical should be performed and recorded in laboratory book

1. Identification of types of copper tubes (dia. 3 mm, 6 mm, 12.5mm)
2. Identification of types of brazing road and its composition
3. Identification of oil and grease removals, fire hazard of the removals
4. Familiarization of joining material, gasket, pipe joint
5. Introduction of various insulating material, properties, fire hazard, etc.
6. Soldering and Brazing – types of brazing, preparation, purging. applying flux, applying heat.
7. Pipe Bending – Introduction to tools and different bends, pipe cutting.
8. Electrical requirement – introduction and familiarization with electrical symbols, circuit diagram of the RAC system
9. Introduction to gas welding set, simple gas welding, arc welding
10. Identification and testing of resistor, diodes and transistors
11. Identification of refrigerant cylinder by color coding and standing pressure – types of cylinder
12. Technique of glass wool filling method in conventional refrigerant.

RAC Systems Installation & Maintenance Lab. – I

1. Handling, use and familiarization with refrigeration tools and accessories such as: (a) Tube cutter (b) Tube bender [spring type] (c) Flaring tool (d) Swaging tool (e) Pinch off tools (f) Service valve wrench (g) Service valve (h) Adjustable wrench (i) Spanner set (j) Allen Key (k) Gauges (l) Blow lamp (m) Service cylinder (n) Gauge manifold (o) Wheel puller (p) Vacuum pump (q) Halide torch (r) Practicing of related operations.
2. Study of the following units: (a) Domestic refrigerator (b) Water cooler (c) Room Air conditioner (d) Evaporative cooler (e) Experimental ice plant.
3. Experimental ice plant.
4. Study of the following components and controls: (a) Compressor: open type and sealed types (b) Thermostatic expansion valve (c) Surface condenser (d) Different types of evaporators (e) Solenoid valve (f) Thermostat for refrigeration (g) H.P. and L.P. cut out (h) Gil safety switch (i) Strainers and driers.

Level 6 (Semester4)
RAC Piping Systems – II

Unit I
Pipe Size Calculations: Pipe sizing, pipe sizing formulae, pipeline wall thickness calculation, elements of total dynamic head–static head, pressure head, velocity head, friction head, Pump power required, Cavitations in pumps, NPSH required and NPSH available for pumps.

Unit II
Pipe Stress Analysis: Objectives and definition of stress analysis, piping loads, piping stresses-primary, secondary, pipe span, calculations flexibility analysis–expansion loops and expansion joints, concept of thermal expansion, providing flexibility in piping

Unit III
Assembly and Erection: Fabrications materials for piping systems, fabrication drawings, fabrication processes, Assembly-alignment, flanged joints, threaded joints,

Unit IV
Piping System Testing: Examinations methods, visual examination, magnetic particle examination, Liquid penetrant examination, radiographic examination, ultrasonic examinations,

Unit V
Testing–leak, test, preparation for leak test, hydrostatic leak test, pneumatic leak test, sensitive leak test, examination of welds

Recommended Books
3. Piping and Pipeline Calculations Manual by J. Phillip Ellenberger
4. The fundamentals of piping design by Peter Smith.

Reference books:
2. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore.
3. ASHRAE handbook, 2002

Refrigeration & Air-conditioning Material – II

Unit I

Component Material: Material used in expansion valve, different type of valve material

Unit II

Material used in cooling towers, pipeline materials, drying materials, jointing, material, synthetic repair materials.

Unit III

Oils and Lubrication: Need of lubrication, types of lubrication, properties of lubrication oils, lubrication systems

Unit IV

Selection of refrigerant lubricant, compatibility of lubricant with refrigerant fluidrefrigeration oil with additives, the effect of refrigerant on lubricant density, solvent and cleaning.

Unit V

Tubing: Soft copper tubing, hard-drawn copper tubing, steel tubing, normal size copper tubing, Cutting tubing, bonding tubing, connecting tubing, flaring tubing.

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi

Reference books

1. Modern Refrigeration and Air Conditioning by Andrew D. Althouse,Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC

RAC Maintenance – I

Unit I

RAC Tools: Engineering hand tools: spanners, screwdrivers, pliers, hammers, brazing, welding, flaring tool, tube bender, hammer, wrenches, shock wrenches, files, hacksaws, wood saws, electrical hand drill, sheet metal snips, Allen keys pop riveter, chisels, pulley extractors, Center punch, wire brush, drill bits, oil can, knife, inspection lamp, bolt extractor

Unit II

Measuring equipment's- steel tape measure, feeler gauge, Caliper, micrometer, engineers levels, pocket type of thermometer, sling psychomotor, system analyzers, temperature analyzers, electronic leak detector, voltmeter, clamp-on ammeter

Unit III

Specialist tools and accessories: flexible charging line, bending springs, pipe tube cutter, fin combs, soldering and brazing equipments, Vacuum pump, charging cylinders, electric test lamps, jumper lead, welding goggles

Unit IV

Pipe installation work, pumping down the system, purging the system, starting the plant

Unit V

Using a system analyzer, transferring and handling liquid refrigerant

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
3. Electric controls for Refrigeration and Air Conditioning by B.C. Langley, D.B. Taraporevala sons and co. pvt.ltd., Bombay

Reference books

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore
2. Refrigeration and Air Conditioning by P.L.Ballaney, Khanna publishers, New Delhi
3. Modern Refrigeration and Air Conditioning by Andrew D. Althouse,Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC
4. Refrigeration and Air Conditioning Technology by William C. Whitman, William M. Johnson and John A. Tomczyk, Delmar Thomson learning, USA

RAC Installation Techniques - I

Unit I

Introduction: Installation operation, adding oil, testing for leak detection

Unit II

Evacuation and dehydration, removing air, charging of the system, through suction valve, through discharge valve.

Unit III

Installation of Room Air-Conditioner: Selection of proper location, providing proper slope and provision for to drain water

Unit IV

Ventilation arrangement for window air conditioner, wiring diagram for installation for room air, conditioner

Unit V

Installation of split air conditioner, providing arrangement for pipes and pipe, pipe insulations

Recommended books

1. Air conditioning: procedures and installation by V. Paul Lang, CBS publishers &distributors, Delhi

2. Refrigeration Technicians pocket book by F.H. Meredith, Butterworths

(6.VP.03) RAC System Installation & Maintenance Lab. – II

1. Leak detection in refrigeration system by different methods.
2. Air removal and charging of a refrigeration unit.
3. Testing of a refrigeration system to find out: (a) Refrigerating capacity (b) Power input c) C.O.P.
4. Determination of psychrometric properties of air with the help of a sling psychrometer and aspiration psychrometer.
5. Determination of bye pass factor of a cooling coil.
6. Determination of humidifying efficiency of a evaporative cooler.
7. Determination of cooling load for a specified situation.
8. Study of the following system by visit: (a) Ice Plant (b) Cold storage plant (c) Control air conditioning system.

SUGGESTED READING:

REFRIGERATION AND AIR CONDITIONING: A Sarao REFRIGERATION AND AIR CONDITIONING: RS Khurmi

RAC Piping Systems Lab.

List of Experiments
Any six of the following practical should be performed and recorded in laboratory book:

1. Study of piping codes, ASME codes and standards, ASTM Specifications
2. Study of Pipe-seamless, welded pipes, pipe sizes, dimensional specifications, material specifications, pipe ends
3. Study of pipe fittings–elbows, tees, flanges, butt welded end fittings, socket welded and threaded end fittings
4. valves–gate valve, globe valve, check valve, ball valve, plug valve, butterfly valve, control valve, pressure relief valve, valve codes and standard, valve size, pressure class rating.
5. Study of pipeline wall thickness calculation
6. Study of NPSH required and NPSH available for pumps
7. Study of piping load and piping stresses
8. Study of different leak detection methods
9. Checking the performance of air ducting system

Level 7 (Semester 5)

RAC Maintenance - II

Unit I

Checking the charge, electrical circuits (servicing), evacuation of the system, installation, and location of main components, leak detection methods

Unit II

Servicing Techniques: Piping and Joining Work, Burn out repair, capillary tube cleaning

Unit III

Charging the system, compressor work expansion valve (thermostatic), servicing, hermetic compressor motors (stating problems) repairing leaks, sealed system connections.

Unit IV

Electrical Fault Finding: Compressor motor fails to start, compressor motors tries to start but does not run, compressor motor starts but does not reach running speed, thermostat failure type, pressure cut-out failure, wiring and collection faults

Unit V

Mechanical Fault Finding: Fault analysis by temperature and pressure, methods of confirming the fault, finding the fault when the compressor is not running, abnormal noise problem, domestic system faults

RAC Installation Techniques – II

Unit I

Commercial Installations of Refrigeration Systems: Ice manufacturing plant, ice bank

Unit II

Commercial Installations of Refrigeration Systems: Cold storage plant, milk dairy plant

Unit III

Commercial Installation of Air Conditioning Systems: Office air conditioning, Hotel air conditioning

Unit IV

Central air conditioning, Designs, Factors of consideration for Central AC

Unit V

Automobile air conditioning: Need, Types, Selection of AC System, Ducts

Automobile Air Conditioning

Unit I

Introduction: Methods of refrigeration. Vapour compression refrigeration system, vapour absorption refrigeration system, applications of refrigeration & air conditioning, Automobile air conditioning, air conditioning for passengers, isolated vehicles, Refrigerated transport vehicles, applications related with very low temperatures, Study of Psychometric
charts: Psychometric properties, tables/charts, psychometric processes, comfort charts, factors affecting comfort, effective temperature, ventilation requirements.

Unit II

Refrigerants & AC Systems: Importance of Refrigerant- Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants; applications of refrigerants, refrigerants used in automobile air conditioning, Air Conditioning Systems- Classification, layouts, central / unitary air conditioning systems, System components, Switch and electrical wiring circuit.

Unit III

Design Automobile AC system: Load Calculations & Analysis- Design considerations for achieving desired inside/room conditions with respect to prevailing outside/environment conditions. Factors affecting/contributing towards the load on refrigeration & air conditioning systems, Cooling& heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine

Unit IV

Air Distribution: Air Distribution Systems- Distribution ducting, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations
Electronic control : Air Routing & Temperature Control - Objectives of the dashboard re-circulating unit, automatic temperature control, controlling flow, control of air handling systems & air flow through - evaporator care

UNIT V

AC Service & Control: Air Conditioning Service- Air conditioner maintenance & service - removing & replacing Components. Compressor service, Testing, Diagnosis & trouble shooting of air conditioning system, Refrigerant gas charging procedure &. Servicing of heater system, Air Conditioning Control - Common controls such as thermostats, humidistat, control dampers, pressure cut outs, relays.

Non-conventional Refrigerating System

1. Vapour Absorption Refrigeration System: Principle of absorption system, comparison between vapour compression system and vapor absorption system, theory of binary mixtures,
2. Aqua-ammonia vapour absorption system, theory of mixtures, temperature concentration diagram and enthalpy concentration diagram, processes used in aqua-ammonia absorption system, adiabatic mixing, separation, throttling process,
3. Vapour absorption system its components, working principle and mathematical analysis, b. Lithium-bromide- water absorption system its components, working principle, and mathematical analysis
4. Steam Jet Refrigeration System: Introduction, steam jet refrigeration system, components of steam jet refrigeration system, advantage and limitation of steam jet refrigeration system, performance of steam jet refrigeration system
5. Thermo-Electric Refrigeration System: Introduction, thermo-electric effects, Seebeck effect, Peltier effect, Thomson effect

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi

Automobile AC Lab.

1. To study the load requirement of AC in the vehicle.
2. To design the AC System for the automobile according to the use.
3. To select the components for Automobile AC System
4. To install the AC System in automobile
5. To diagnose the fault in Automobile AC System
6. To conduct the mechanical repair in the Automobile AC System
7. To charge the Refrigerant in the Automobile AC System
8. To test the Automobile AC System.

AC Components and Assembly Laboratory

Any five of the following practical should be performed and recorded in laboratory book

1. To study hermetically sealed compressor, condensing units, performance, volumetric efficiency, performance of the ideal compressor and power requirement
2. To study different types of condensers and condenser design
3. To study different types of evaporators and evaporator performance, pressure drop in tubes, frost.
4. To study selection of expansion valves, and capillaries for various refrigeration and air conditioning applications
5. Find out the heat rejection factor of condenser, condenser capacity, efficiency and effect of fouling factor
6. Capillary bore checking, performance test conducted by test rig (consisting of capillary tube and

thermostatic expansion valve) for finding C.O.P.

7. Familiarization of capillary selection guide

Level 7 (Semester 6)

RAC Safety

Unit I

Introduction to Industrial Safety: History and development of safety movement, need for safety, safety legislation: acts and rules, safety standards and codes, safety policy: safety organization and responsibilities and authorities of different levels, accident sequence theory, causes of accidents, accident prevention and control techniques, plant safety inspections, job safety analysis and investigation of accidents, first aid.

Unit II

Overview of Standard: ANSI/ASHRAE Standard, ANSI/ASME boiler and pressure vessel code, refrigeration, piping code, boiler and pressure vessel code, safety for refrigerant-containing components and accessories, nonelectrical, uniform mechanical code, basic national mechanical code

Unit III

Safety on the Job: Personal safety, protective clothing and equipment, harmful substances, safe work, practices, safety when working with electricity, refrigeration safety.

Unit IV

Safety for RAC Engineers: Types of accident, physical injuries from mechanical causes, use of tools and handling precautions, electrical injuries, electrical safety rules

Unit V

Injuries in RAC and Precaution: Refrigerant cylinder, corrosion, burn and other scalds, refrigerants and other gases Construction materials, fire fighting precautions, breathing, toxic gases, asphyxiation and precaution for the same.

Recommended books

1. “Air conditioning Systems principles, equipments and Services”, Joseph Moravek, Prentice Hall

Reference books

1. “HVAC Handbook”, Part I and II, ISHRAE
2. “Industrial refrigeration Hand Book”, Wilbert F. Stoecker

Process Planning and Cost Estimation

1. Introduction to Process Planning:

Process Planning—Definition, Purpose of Process Planning, Concept of Process Planning, Objectives of Process Planning, Scope of Process Planning, and Information required to do Process Planning, Preparing Operation Planning Sheet

2. Process Planning activities:

Process Planning Procedure, Approaches of Process Planning, Manual Process Planning, Computer Aided Process Planning, Factors Affecting Selection Process, Machine Capacity,
Determination of Man, Machine and Material Requirements, Factors Influencing Choice of Machinery

3. Introduction to Cost Estimation:
Reasons for doing Estimates, Importance of Estimating, Objectives or Purpose of Estimating, Functions of Estimating, Cost Accounting of Costing, Importance of Costing, Aims of Cost Accounting, Difference Between Cost Estimating and Cost Accounting, Cost of Product (Ladder of Cost) Production Cost Estimation, Determination of Material Cost, Mensuration in Estimating

4. Assembly & Installation Time Calculation:
Time calculation: Study of RAC requirement, design of RAC System, Selection of RAC components & material, Fabrication of ducts and distribution system, installation of RAC System, Testing of RAC System.

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Software Development(SD)
Branch Code:106

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME

Software Development

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV511	IT Foundations & Programming Concepts	30	10	5	5	20	30		50	2
2	BSDV512	Web Designing	30	10	5	5	20	30		50	2
3	BSDV513	Programming in C	30	10	5	5	20	30		50	2
4	BSDV514	Operating System (OS)	30	10	5	5	20	30		50	2
6	BSDP511	Web Designing Lab	30				20		30	50	1
7	BSDP512	C Programming Lab	30				20		30	50	1
8	BSDP513	Language Lab	30				20		30	50	2
9	BSDT511	Technical Writer (SSC/Q0505)						Any one Training 400 hrs / 8 weeks		150	12
	BSDT512	Infrastructure Engineer (SSC/Q0801)									
	BSDT513	Associate – CRM (SSC/Q2202)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV521	Data Structures	30	10	5	5	20	30		50	2
2	BSDV522	Concepts of Data Mining	30	10	5	5	20	30		50	2
3	BSDV523	OOPs with Java	30	10	5	5	20	30		50	2
4	BSDV524	Multimedia Tools & Applications	30	10	5	5	20	30		50	2
6	BSDP521	Data Structure Lab	30				20		30	50	1
7	BSDP522	Java Lab	30				20		30	50	1
8	BSDP523	IT Tool Lab	30				20		30	50	2
9	BSDT521	Web Developer (SSC/Q0503)						Any one Training 400 hrs / 8 weeks		150	12
	BSDT522	Test Engineer (SSC/Q1301)									
Total			610							500	24

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching / Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV631	Linux Operating System – Operations and Management	30	10	5	5	20	30		50	2
2	BSDV632	Software Engineering	30	10	5	5	20	30		50	2
3	BSDV633	Web Development using PHP	30	10	5	5	20	30		50	2
4	BSDV634	Windows Development Fundamental	30	10	5	5	20	30		50	2
5	BSDE631	Uni. Human Values & ethics/Env. &Eco.	30	10	5	5	20	30		50	2
6	BSDP631	Web Development using PHP Lab	30				20		30	50	1
7	BSDP632	Window Development Fundamentals Lab	30				20		30	50	1
8	BSDT631	Junior Data Associate (SSC/Q0401)						Any one Training 400 hrs/ 6 weeks		150	12
	BSDT632	IP Executive (SSC/Q6201)									
	BSDT633	Security Analyst (SSC/Q0901)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV641	Software Testing and Project Management	30	10	5	5	20	30		50	2
2	BSDV642	Android Application Development	30	10	5	5	20	30		50	2
3	BSDV643	Window Configuration and Server Administration	30	10	5	5	20	30		50	2
4	BSDV644	Management Information Systems	30	10	5	5	20	30		50	2
5	BSDE641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BSDP641	Android Application Development Lab	30				20		30	50	1
7	BSDP642	MIS Lab	30				20		30	50	1
8	BSDT641	QA Engineer (SSC/Q1302)						Any one Training 400 hrs/ 8 weeks		150	12
	BSDT642	Software Engineer (SSC/Q4601)									
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV751	Technology Trends in IT	30	10	5	5	20	30		50	2
2	BSDV752	Window Mobile Application Development	30	10	5	5	20	30		50	2
3	BSDV753	Introduction to Python Programming	30	10	5	5	20	30		50	2
4	BSDV754	Introduction to Microprocessors	30	10	5	5	20	30		50	2
6	BSDP751	Window Mobile Application Development Lab	30				20		30	50	1
7	BSDP752	Python Programming Lab	30				20		30	50	1
9	BSDT751	Management Trainee (SSC/Q6301)						Any one Training 400 hrs/ 6 weeks		150	12
	BSDT752	Associate - Transactional F&A (SSC/Q2301)									
	BSDT753	Consultant Network Security (SSC/Q0917)									
Total			480							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV761	Introduction to AI/ Computer Network Security	30	10	5	5	20	30		50	2
2	BSDV762	e-Commerce / Introduction to Biometrics	30	10	5	5	20	30		50	2
3	BSDE761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BSDP761	Major Project based on AI or Computer Network Security	180						150	150	6
5	BSDT761	Master Trainer for Software Developer (SSC/Q0509)						Any one Training 400 hrs/ 6 weeks		200	12
	BSDT762	Hardware Engineer (SSC/Q4701)									
Total			670							500	24

Detailed Curriculum

Software Requirements

1. C Compiler(Turbo C/C++ etc)
2. WYSIWYG HTML editor (Eclipse, Netbeans etc)
3. Python
4. JDK
5. Apache Tomcat
6. PHP,WAMP/XAMPP
7. DBMS(ORACLE, MySQL etc)
8. .Net Framework
9. Android Studio

Level 5 (Semester I)

IT Foundations & Programming Concepts

Computer characteristics: Speed, storage, accuracy, diligence; Digital signals, BinarySystem, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet; Hardware & Software; Von Neumann model.

Hardware: CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR

RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD/DVD-Writer; Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen Voice Input, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD, LED; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.

Software: System software, Application software; concepts of files and folders,Introduction to Operating systems, Different types of operating systems: single user, multitasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application software: Generic Features of Word processors, Spread sheets and Presentation software; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses & Protection, Free software, open source.

Computer Networks and Internet: Connecting computers, Requirements for a network:Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line Wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, Web Programming Languages.

Information Technology And Society: Indian IT Act, Intellectual Property Rights, issues.Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

Programming Concepts & Techniques: Program Concept, Characteristics of Programme,Stages in Program Development, Tips for Program Designing, Programming Aids, Algorithms, Pseudo code, Notations, Design, Flowcharts, Symbols, Rules, compiler & Interpreter. Introduction to programming techniques, Top-down & Bottom-up approach, Unstructured, & Modular programming, Cohesion, Coupling, Debugging, Syntax & Logical Errors, Linking and Loading, Testing and Debugging, Documentation**.**

Reference Books:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

Web Designing

UNIT-I

Introduction to HTTP, HTML, Basic HTML Tags, Body Tags, Coding Style, Modifying & formatting Text, Lists – Unordered, Ordered, Definition, Insert Links -Linking to another Document, Internal Links, Email Links, Relative and Absolute Links, Insert Images - Referencing Images, Clickable Images, Image Placement and Alignment, Image Size, Image Margins, Image Formats, Image Maps- Defining an Image Map, Advanced Coloring Body Content, Working with tables - Basic Tables, Table Attributes, Table Cell Attributes, Table Row Attributes, Tables Inside of Tables, Invisible Spacers, Working with Frame-Based Pages- Creating Windows, Single Window Frames, Creating Column Frames, Creating Row Frames, Creating Complex Frames.

UNIT-II

Cascading Style Sheet (CSS) – Introduction, creating style, using inline and external CSS, Creating Divs with ID style, Creating Tag& Class style, creating borders, Navigation links, creating effects with CSS.

JavaScript – Introduction, use of JavaScript in webpages. Understand JavaScript event model, use some basic event and control webpage behavior.

UNIT-III

DESIGNING WEBSITES WITH DREAMWEAVER/EXPRESSION Web/AMAYA/COFEE CUP WYSIWYG HTML Editor - Introduction to WYSIWYG HTML editor, advantages of using HTML editors, Creating a New Site, Creating a New Page, Adding Images with Alternate Text, Inserting & Formatting Text, Aligning Images, Creating an Email Link, Linking to Other Websites, Testing & Targeting Links, Organizing Files & Folders

CREATING & INSERTING IMAGES - Optimizing Images for the Web, Saving GIFs & PNGs in Photoshop, Inserting GIFs, Adjusting Transparency Settings, Saving JPGs for the Web

UNIT-IV

DESIGNING ACCESSIBLE TABLES - Understanding Tables & Accessibility, Using Tables for Tabular Data, styling a Table, Editing Table Layouts, Adding Style to a Table Using CSS CREATING WEBSITES WITH FRAMES - Introducing Frames, creating a Frameset, Opening Pages into Frames, Controlling Scrollbars & Borders, Targeting Links in Frames CUSTOMIZING THE INTERFACE - Opening an Existing Site, Reviewing Menu Options & Preferences, Comparing the Macintosh & PC Interfaces, Previewing in Browsers & Device Central

Introduction to Responsive Web Designing – Introduction, advantages, creating and using responsive web pages.

UNIT-V

Web Hosting - What is Domain? Introduction to DNS, how to register a Domain? What is web hosting? How to get a web hosting? Host your website on web Server. FTP - FTP Introduction, FTP Commands Viewing Files and Directories, FTP Commands Transfer and Rename files, FTP with WS FTP/ CuteFTP, Filezilla on Windows.

Reference Books:

1. Internet & Web Development, Soma Das Gupta, Khanna Publishing House
2. Web Designing and Development, TanweerAlam, Khanna Publishing House

Programming in C

Introduction to 'C' Language - Character set, Variables and Identifiers, Built-in Data Types,Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

Conditional Statements and Loops - Decision making within a program, Conditions,Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.

Arrays - One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of anelement from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions

Functions - Top-down approach of problem solving, Modular programming and functions,Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

Storage Classes - Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

Structures and Unions - Structure variables, initialization, structure assignment, nestedstructure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

Pointers - Address operators, pointer type declaration, pointer assignment, pointerinitialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

File Processing - Concept of Files, File opening in various modes and closing of a file,reading from a file, writing onto a file

Reference Books:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Test your Skills in C, R. S. Salaria, Khanna Publishing House

Operating System (OS)

System Software: Operating System, Compiler, Interpreter and Assembler;

Operating System: Need for Operating System, Functions of Operating System(Processor Management, Memory Management, File Management and Device Management), Types of Operating System-Interactive (GUI based), Time Sharing, Real Time and Distributed, commonly used Operating System: UNIX, LINUX, Windows, Solaris, BOSS (Bharat Operating System Solutions); Mobile OS – Android, Symbian, IOS.

Utility Software: Anti-Virus, File Management tools, Compression tools and DiskManagement tools (Disk Cleanup, Disk Defragmenter, Backup).

Reference Books:

1. Operating Systems, EktaWalia, Khanna Publishing House

Web Designing Lab

1. Generic awareness about Hyper Text s Language (HTML).
2. Designing of websites.
3. Basics of HTML tags.
4. Cascading Style Sheet (CSS).
5. Functional knowledge of web hosting

C Programming Lab

1. Write a Program to find the area and circumference of circle
2. Write a Program to swap two numbers with or without third variable
3. Write a program to convert temperature from Fahrenheit to Celsius
4. write a program to add two numbers
5. Write a C program to input any alphabet and check whether it is vowel or consonant.
6. Write a C program to input any character and check whether it is alphabet, digit or special character.
7. Calculator program with Basic operations using switch
8. Program to find factorial of a given number
9. Program to find sum of Fibonacci series up to N Terms.
10. program to check whether the number is palindrome or not
11. Program to find the second largest number in an array.
12. 2. Write a 'C' function to print reverse of a given number using return and parameter method.(call by value)
13. 3. Write a 'C' function to calculate the sum of digits of a given number using return and parameter method.(call by value)
14. 4. Program to insert element in an array.
15. 5. Find the repeating elements in a given array
16. C program to delete duplicate element in an array.
17. C program to find multiplication of two matrices.
18. 8. Program to store and access “id, name and percentage” for 3 students. Structure array is used in this program to store and display records for many students. You can store “n” number of students record by declaring structure variable as ‘struct student record[n]“, where n can be 1000 or 5000 etc.
19. 9. Program to copy one file into another.
20. 0. Program to count number of alphabet, number, spaces, newline characters from a file.

Level 5 (Semester II)

Data Structure

UNIT I

An Overview of Computers and Programming - Simple program logic, The steps involved in the program development cycle, Pseudo code statements and flowchart symbols, Using a sentinel value to end a program, Programming and user environments, The evolution of programming models.

UNIT–II

The concept of data structure, Abstract data structure, Analysis of Algorithm, The concept of List Introduction to stack & primitive operation on stack, Stack as an abstract data type, Multiple Stack, Stacks application: Infix, post fix, Prefix and Recursion, Introduction to queues, Primitive Operations on the Queues, Queue as an abstract data type, Circular queue, Dequeue, Priority queue, Applications of queue

UNIT–III

Introduction to the Linked List of Stacks, Basic operations on linked list, Stacks and queues as a circular linked list, Header nodes, Doubly Linked List, Circular Linked List, Stacks & Queues as a Circular Linked List, Application of Linked List.

UNIT–IV

TREES - Basic Terminology, Binary Trees, Tree Representations as Array & Linked List, Basic operation on Binary tree, Traversal of binary trees: - In order, Preorder & post order, Application of Binary tree, threaded binary tree, B-tree & Height balanced tree, B+ & B* trees, 2-3 trees, Binary tree representation of trees, Counting binary trees

UNIT–V

Sequential Searching, Binary search, Insertion sort, Selection sort, Quick sort, Bubble sort, Heap sort, Comparison of sorting methods

Hash Table, Collision resolution Techniques, Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs, Graph Traversal-Depth first & Breadth first search, Spanning Trees, minimum spanning Tree, Shortest path algorithm

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Publishing House

Concepts of Data Mining

Unit-I

Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:-Dependent Data Marts, Independents Data Marts & Distributed Data Marts, Conceptual Modeling of Data Warehouses: -Star Schema, Snow flake Schema, Fact Constellations, Multidimensional Data Model & Aggregates.

Unit-II

OLAP, Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP & OLTP, OLAP Servers: -ROLAP, MOLAP, HOLAPQueries.

UNIT-III

Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing:-Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics. Guidelines for Successful Data Mining.

Unit-IV

Association Rule Mining:-Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori - Tid, Direct Hasing and Pruning (DHP), Dynamic Item set Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms,

Unit-V

Classification:-Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Basedon Information Theory, Split Algorithm Based on the Gini Index, Over fitting and Pruning, Decision Trees Rules, Naïve Bayes Method.

Cluster Analysis: -Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: -Partitioned Methods, Hierarchical Methods, Density-Based Methods, Dealing with Large Databases. Quality and Validity of Cluster Analysis Methods.

Reference Books:

1. Data Mining and Warehousing, Ikvinderpal Singh, Khanna Publishing House

Object Oriented Programming with JAVA

UNIT–I

C++ vs JAVA, JAVA and Internet and WWW, JAVA support systems, JAVA environment.

JAVA program structure, Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting.

Operators: Arithmetic, Relational, Logical Assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions & its evaluation.

If statement, if…else… statement, Nesting of if…else… statements, else…if Ladder, Switch, ?operators, Loops – While, Do, For, Jumps in Loops, Labelled Loops.

UNIT–II

Defining a Class, Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods.

Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control.

UNIT–III

Arrays: One Dimensional & two Dimensional, strings, Vectors, wrapper Classes, Defining Interface Extending Interface, Implementing Interface, Accessing Interface Variable, System Packages, Using System Package, Adding a Class to a Packages, Hiding Classes.

UNIT–IV

Creating Threads, Extending the Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface.

UNIT–V

Local and Remote Applets Vs Applications, Writing Applets, Applets Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing Parameters to Applets, Aligning the Display, HTML Tags & Applets, Getting Input from the User.

Reference Books:

1. Object Oriented Systems with Java, TanweerAlam, Khanna Publishing House
2. Core Java, TanweerAlam, Khanna Publishing House

MULTIMEDIA – TOOLS & APPLICATIONS

UNIT -I

Introduction To Multimedia, Needs and Areas of use, Identifying Multimedia Elements - Text, Images, Sound, Animation and Video, Making Simple Multimedia With PowerPoint. TEXT - Concepts of Plain & Formatted Text, RTF & HTML Texts, Using Common Text Preparation Tools, Conversion to and from of Various Text Formats, Creating text using standard software.

UNIT-II

SOUND - Sound and its Attributes, Sound and Its Effects in Multimedia, Frequency, Sound Depth, Channels and its Effects on Quality and Storage, Size Estimation of Space of a Sound File, Sound Card Standard – FM Synthesis Cards, Waves Table Cards, MIDI and MP3 Files and Devices, 3D Sounds, Recording and editing sound using sound editors like Audacity, Sound forge etc.

UNIT-III

IMAGES - Importance of Images Graphics in Multimedia, Vector and Raster Graphics, Regular Graphics vs. Interlaced Graphics, Image Capturing Methods - Scanner, Digital Camera Etc. Color models-RGB, CYMK, Hue, Saturation, and Brightness, Various Attributes of Images Size, Color, Depth Etc, Various Image File Format BMP, DIB, CIF, PIC, and TIF Format Their Features And Limitations, Image format conversion, various effects on images. Create images using Photoshop, CorelDraw and apply various effects, Using Layers, Channels and Masks in images.

UNIT-IV

VIDEO- Basic of Video, Analog and Digital Video Type of Video, Digitization of Analog Video, Video Standard – NTSC, Pal, HDTV, Video Capturing Media /Instruments Videodisk Camcorder Compression Techniques, File Formats AVI, MJPG, MPEG, Video Editing and Movie Making Tools, converting formats of videos, recording and editing videos using video editing software like adobe premiere or Sony Vegas.

UNIT-V

ANIMATION- Concepts of animation, 2D and 3D animation, tools for creating animation, character and text animation, creating simple animation using GIF animator and flash, Morphing and Applications.

Authoring tools for Multimedia – Introduction to various types of multimedia authoring tools, CD/DVD based and web based tools, features and limitations, creating multimedia package using all components.

Reference Books:

1. Multimedia & Its Applications, V.K. Jain, Khanna Publishing House
2. Fundamentals of Multimedia, Ramesh Bangia, Khanna Publishing House

Data Structure Lab

.Implement stack. Write functions like push, pop, Initialize, Empty or Full. 2
.WAP to Convert the Infix expression into postfix using STACK.
.WAP to Convert the Infix expression into Prefix using STACK. 4
.Implement concept of queues
5. Implement circular Queue using Array.
6. WAP to implement STACK using
Link List 7WAP to implement Queue using
Link List
.Implement queues as a circular linked list. 9
.Implementing doubly linked list
10. Binary search tree to sort an array

Java Lab

1. Write a Program to accept a String as a Command line argument and the program should print a
Welcome message.
2. Create a class Box that uses a parameterized method to initialize the dimensions of a box.(dimensions are width, height, depth of double type). The class should have a method that can return volume. Obtain an object and print the corresponding volume in main() function.
3 Write a Program that will check whether a given String is Palindrome or not
4. Write a Java Program for Multiplication of two matrices.
5. Write a program to check if given String is Palindrome or not.
6. Given two strings, append them together (known as "concatenation") and return the result. However, if the concatenation creates a double-char, then omit one of the chars. If the inputs are "Mark" and "Kate" then the ouput should be "markate".
7. Create an abstract class Instrument which is having the abstract function play.
Create three more sub classes from Instrument which is Piano, Flute, Guitar. Override the play method inside all three classes printing a message
"Piano is playing tantantantan " for Piano class
"Flute is playing toottoottoottoot" for Flute class
"Guitar is playing tintintin " for Guitar class
8. Write a program that takes as input the size of the array and the elements in the array. The program then asks the user to enter a particular index and prints the element at that index.
This program may generate Array Index Out Of Bounds Exception. Use exception handling mechanisms to handle this exception. In the catch block, print the class name of the exception thrown.
9. Create two threads and assign names 'Scooby' and 'Shaggy' to the two threads. Display both thread names.
10 0. Write an Applet program in Java to display "Welcome to Java".

Level 6 (Semester III)

Linux Operating System - Operations & Management

UNIT – I

Linux introduction and file system - Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell.

Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories, Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces, Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down.

UNIT–II

Essential Linux commands Understanding shells, Processes in Linux process fundamentals, connecting processes with pipes, redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep, Printing commands, grape, fgrep, find, sort, Cal, banner, touch, file,file related commands-ws, sat, cut, grep, dd, etc.Mathematical commands- bc, expr, factor, units.vi, joe, vim editor

UNIT–III

Shell programming Basic of shell programming, Various types of shell, shell programming in bash, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, shell keywords, Creating Shell programs for automate system tasks and report printing, use of grep in shell, awk programming.

UNIT–IV

System administration Common administrative tasks, identifying administrative files – configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su.Getting system information - host name, disk partitions & sizes, users, kernel.

Backup and restore files, linuxconf. utility in GUI, reconfiguration hardware with kudzu Configure desktop-X configurator, understanding XF86config file, starting & using X desktop. KDE & Gnome graphical interfaces, changing X settings.

UNIT–V

Basic networking administration Setting up a LAN using Linux, choosing peer to peer vs client/server model, setting up an Ethernet Lan, configuring host computers, checking Ethernet connecting, connecting to internet, administration in a networked environment, common networking administrative tasks, the network file system, configuring Ethernet, initializing Ethernet Interface, ifconfig, netstat and netconfig commands a TCP/IP networks, DNS services, routing using Linux, SLIP & PPP services, UUCP.Installation & Administration of mail server, ftp server and Apache web server.

Software Engineering

UNIT - I

SOFTWARE **:** Software Characteristics, Components & Applications, Software Engineering - A Layered Technology, Software Process Models - Linear Sequential Model, Prototype & Rad Model., Evolutionary Software Process Model – Incremental Model and Spiral Model.

SOFTWARE PROJECT MANAGEMENT: Project Management Concepts – People Problem and Process S/W process and Project Metrics : Metrics in The Process and Project Domains . Software Measurement –Size Oriented, Function Oriented Metrics, Extended Function

UNIT - II

SOFTWARE PROJECT PLANNING: Objectives, Scope, Project Estimation, Decomposition Techniques, Empirical Estimation Models.

ANALYSIS CONCEPT AND PRINCIPLES: Requirement Analysis, Communication Techniques, Analysis Principles, Software Prototyping, Specifications.

ANALYSIS MODELING: Elements of The Analysis Modeling, Data Modeling. Functional Modeling and Information Flow, Behavioral Modeling, Data Dictionary.

UNIT – III

DESIGN CONCEPTS AND PRINCIPLES: Design Process, Design Concepts, Design Principles, Effective Modular Design. DESIGN METHODS : Architectural Design Process, Transform Mapping and Transaction Mapping, Interface Design, - Internal and External Design, Human Computer Interface Design, Interface Design Guidelines, Procedural Design.

UNIT - IV

S/W Quality Assurance : Quality Concepts, Matrix for Software Quality, Quality Movement, S/W Q A, S/W Review, Formal Technical Reviews, Formal Approaches to SQA, S/W Reliability, ISO 9000 quality Standards S/W TESTING MODELS : S/W Testing Fundamentals, Test Case Design, White and Black Box Testing, Basic Path Testing, Control Structure

S/W TESTING STRATEGIES : Strategic Approach To S/W Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging

UNIT - V

S/W REUSE : Reuse Process, Building Reuse Components, Classified And Retrieving Components, Economics Of S/W Reuse COMPUTER AIDED S/W ENGINEERING: Introducing of Case, Building Block For Case, Taxonomy Of Case Tools, Integrating Case Environment, Integrating Architecture, Case Repository.

Reference Books:

1. Software Engineering, N.S. Gill, Khanna Publishing House
2. Software Engineering, R.P. Mahapatra, Khanna Publishing House

Web Development using PHP

UNIT I

Introduction to PHP as a programming Language: - Advantages of PHP, the server side architecture Decomposed, overview of PHP, history, object oriented support, benefits in running PHP as a server side script. Installing a web server, Internet information server, and IIS installation, testing web server setup.

UNIT II

The basics of PHP: - data types, variables, constants, operators, Arrays, Conditional statements (if statement, Executing Multiple Statements, else if clause and switch
statement), Iterations (for loop, while loop, controlling an array using a while loop, do while statement, for each loop and special loop key words)

UNIT III

Functions, user defined functions, functions with arguments, built in functions (print(), includer(), header(), phpinfo()), PHP server Variables, working with date and time , performing mathematical operations , working with string functions . System Variable (GET, POST, cookies& Session, Forums)

UNIT IV

Working with forms, form elements (Text Box, Text Area, Password, Radio Button, Checkbox, The Combo Box, Hidden Field and image), adding elements to a form, uploading files to the Web Server using PHP, building a challenge and response subsystem and understanding the functionality of the FORM attribute Method Regular Expressions: - Engine, types of Regular Expressions, symbols used in Regular Expressions. Error handling in PHP: - Displaying errors, warnings, types of errors, error levels in PHP, logging Errors and Ignoring errors.

UNIT V

Data base connectivity using PHP (MySQL, ODBC, ORACLE, SQL) Performing, executing Commands, different types of Data Base Operations like Insertion, deletion, update and query on data

Reference Books:

1. Mastering PHP, WebTech Solutions, Khanna Publishing House
2. Learning PHP, Ramesh Bangia, Khanna Publishing House

Window Development Fundamentals

1. Programming web applications
2. Working with data and services
3. Troubleshooting and debugging web applications
4. Working with client-side scripting
5. Configuring and deploying web applications
6. Understanding core programming
7. Understanding object-oriented programming
8. Understanding general software development
9. Understanding web applications
10. Understanding desktop applications
11. Understanding databases

Reference Books:

1. Internet and Web Development, Soma Das Gupta, Khanna Publishing House

Web Development using PHP Lab

1 . Write a program to display “Hello World”.
2 . Write a program to print an array of Strings.
3 Write a program to print each element of an array using foreach().
4. Write a program to find number of elements in an array.
5. Write a program to sort elements in an array in ascending order.
6. Write a program to find the sum of elements in an array.
7 . Write a program to find the product of elements in an array.
8 . Write a program to split a string as array elements based on delimiter.
9 Write a program to combine the array elements into a string with given delimiter.
10. Write a program to join the array elements into a string.
11. Write a program to merge two arrays into a new array.
12. Write a program to remove the duplicated values from an array.
13. Write a programs to create simple Login and Logout using sessions.
14. Write a program to Upload a file to the Server.
15. Write a program to connect to the server and selecting database.
16. Write a program to Insert records to the table in Database.
17. Write a program to fetch records from the table in Database.
18. Write a program to Store and Read an image in Database.
19. Write a program to create a simple Registration form.
20. A simple CRUD operations using PHP and Mysql.

Window Development Fundamentals Lab

1. Client-side scripting Programs
2. Deploying web applications
3. Basic object-oriented programs
4. Understanding desktop applications
5. Basic SQL Queries

Level 6 (Semester IV)

Software Testing & Project Management

UNIT - I

Testing basics and Development Models: Principals and context of testing in software production, Usability and Accessibility Testing, Phases of Software Project, Process models to represents different phases, Software Quality Control and its relation with testing, validating and verification, Software Development life cycle models, various development models.

White Box Testing: White Box Testing - Static Testing, Structural Testing-Unit code functional testing, Code coverage testing, code complexity testing,

Black Box Testing- What? Why and when to do Black box testing, Requirements based testing, Positive and Negative Testing, Boundary value testing, Decision Tables, Equivalence Partitioning, State Based or Graph Based Testing, Compatibility Testing, User Documentation Testing, Domain Testing.

UNIT - II

Integration Testing: Introduction and types of integration testing, Scenario testing, defect bash. System and Acceptance Testing- Overview, functional and non-functional testing, Acceptance testing.

Overview of some software testing tools: WinRunner, LoadRunner, Test Director.

(Some practical should be conducted using these tools)

UNIT- III

Performance Testing- Introduction, factors related to performance testing, methodology for performing testing, Regression Testing,

Ad hoc Testing- Overview, Buddy & pair testing, Exploratory testing, Interactive testing, Agile and extreme testing.Testing of Object Oriented Testing – Introduction, Differences in OO testing.

UNIT – IV

Software Project Management: Overview, Software Project Management Framework, Software Development life cycle,

Organization Issues and Project Management, Managing Processes, Project Execution, Problems in Software Projects, Project Management Myths and its clarifications.

Software Project Scope: Need to scope a software project, scope management process, communication techniques and tools, communication methodology

Software Requirement Gathering and Resource allocation: Requirement specifications, SRS Document preparation, Resources types for a software projects, requirement for resources allocation.

UNIT – V

Software Project Estimation: Work Breakdown structure (WBS), steps in WBS, Measuring efforts for a project, techniques for estimation – SLOC, FP, COCOMO and Delphi methods.

Project Scheduling: Scheduling and its need, scheduling basics, Gannt Chart, Network scheduling techniques, Pert and CPM.Using a Project Management Tool: Introduction to MS Project 2000, Managing tasks in MS Project 2000, Tracing a project plan, creating and displaying project information reports.

Android Application Development

UNIT-I

Android Introduction, Smartphones future, Preparing the Environment, Installing the SDK, Creating Android Emulator, Installing and Using Eclipse, Installing Android Development Tools, Choosing which Android version to use Android Architecture, Android Stack, Android applications structure Creating a project, Working with the AndroidManifest.xml, Using the log system Activities Introduction to UI – Layouts, Fragments, Adapters, Action bar, Dialogs, Notifications , UI best practices

UI Architecture, Application context, Intents, Activity life cycle, Supporting multiple screen sizes

Unit – II

Designing User Interface Using Views – Basic Views- TextView, Button, Image Button, Check Box, Toggle Button, Radio Button etc., Progress Bar View and Auto Complete Text View, Time Picker and Date Picker View, List View,

Image View, Image Switcher and Grid View, Digital Clock & Analog Clock Views Notification and Toast, Parameters , on Intents, Pending intents, Status bar notifications Toast notifications.

UNIT-III

Menus, Localization, Options menu, Context menu Dialogs-Alert dialog, Custom dialog, Dialog as Activity Orientation and Movement- Pitch, roll and yaw, Natural device orientation, Reference frame remapping SMS - Sending and Receiving Working with Media –Playing audio and video, Recording audio and video.

UNIT-IV

Location and Maps - Google maps, Using GPS to find current location.

Working with data storage - Shared preferences, Preferences activity, Files access, Using External storage, SQLite database Animation-View animation, Drawable animation Working with Sensors - Finding sensors, Accelerometers, Gyroscopes, Other types Working with Camera – Controlling the camera, Preview and overlays, Taking pictures

UNIT-V

Content providers- Content provider introduction, Query providers

Network Communication - Web Services, HTTP Client, XML and JSON, Using e-mails.

Services - Service lifecycle, Foreground service, Creating own services

Publishing and Distributing Your App -Preparing for publishing, Google Play requirements, Signing and preparing the graphics, Publishing to the Android Market, Monetization, Tips on becoming a top app, Google analytics

Reference Books:

Learning Android, Ramesh Bangia, Khanna Publishing House

Windows Configuration and Server Administration

Understanding Windows Programming Basics: Identify Windows application types, Implementuser interface design.

Creating Windows Forms Applications: Create and handle events, Understand Windows Formsinheritance, understand how to create new controls and extend existing controls, Validate and
implement user input, Debug a Windows-based application.
Creating Windows Services Applications: Create a Windows Services application, InstallaWindows Services application.

Accessing Data in a Windows Forms Application: Understand data access methods for aWindows Application, Understand data bound controls.
Deploying a Windows Application: Understand windows application deployment methods,integrating data.
Network basics: Type of Networks, Topologies, Transmission media, Install UTP(Straight, Cross,Rollover Cables), IP Addressing, Subneting, OSI Model, TCP/IP Model, Wireless Network, Network Devices.

Installation: Installation Server, Drivers, Working with windows server Devices, TroubleshootingDevices & Drivers, Managing system updates.
Working With Disk Storage: Type of Disk Storage, Type of volumes, Implementing fault tolerance,Use disk management tools, Disk Quota, Troubleshooting disk management, Shadow copy**.Domain Controller**: Install Active Directory, Manage Active Directory Component, Working withOU Structure, Working with Domain User account, Working with Domain Groups, Troubleshooting Active Directory.

Domain Name Services (DNS): Define Name resolution, Install DNS, Configure DNS Client, Manageand Troubleshoot DNS.

Dynamic Host Configuration Protocol: Configure DNS Server, Working With Super Scope,Configure DHCP Client, Manage and Troubleshoot DHCP Server.

Backup and Restore: Requirement for Backup and Recovery AD, Issue for AD Backup andRecovery, Steps for Backup and Recovery AD.

Management Information System

Unit I

An introduction to information systems, Information systems in organizations, Information Technology Concepts, The IS Revolution; Information requirement for the different levels lf management, transaction processing system, Management information 34 system, Decision support system. Strategic Role of Information Systems.Business Processes; Information management, and Decision Making. Computers and Information Processing;

Unit II

Transaction processing system; hardware and software requirements, tools used, case studies, merits and demerits of transaction processing system.

Unit III

Managerial control, Information and tools required, difference between transactional system and managerial system. Frequency of taking outputs, Need for interconnected system, common database, Redundancy control, case studies. Decision support system, concept and tools, case studies, virtual organizations, strategic decisions-unstructured approach, cost and values of unstructured information.

Unit IV

Optimization techniques, difference between optimization tools and DSS tools expert system, difference between expert system and management information system. Role of chief Information officer.

Android Application Development Lab

1. Write a simple Application which will print "Hello World!”
2. Write a simple Application that uses UI Layout and Control.
3. Write a simple Application that makes use of Style & Themes.
4. Write a simple Application that uses Event Handling.
5. Write a simple Application that uses Alarm, Notification.
6. Make a location based app.
7. Write a program that shows the use animation.
8. Write a program that shows the use of Image Effects.
9. Write a program that shows the use Image Switcher.
10. Write a program that shows the use of database.

MIS Lab

Experiments to be covered based on the theory covered in class

Level 7 (Semester V)

Technology Trends in IT

Unit-I

Internet of Things (IoT) –Definition of IoT, History of IoT, IoT vs. similar concepts,Application/Segment overview, Technology overview

Unit-II

Big Data Analytics: Concepts, examples of big data analytics, benefits of big data analytics,Technologies, and Applications, requirements for being successful with big data analytics

Unit-III

Cloud Computing – Introduction, Why cloud services are popular, advantages, Characteristics,Service models, Deployment of cloud services, Potential privacy risks

Unit-IV

Cyber Security – Introduction, risks, Malicious code, Hacker, attacker or intruder, Cyber securityPrinciples, Information Security (IS) within Lifecycle Management, Risks & Vulnerabilities, Incident Response, Future Implications & Evolving Technologies

Unit-V

Wearable Technologies – Introduction, Applications of Wearable Technology, Challenges toWearable Technology, various Wearable devices.

Reference Books:

1. Computer Today, A. Ravichandran, Khanna Publishing House
2. Internet of Things, Jeeva Jose, Khanna Publishing House
3. Big Data and Hadoop, V.K. Jain, Khanna Publishing House
4. Data Sciences and Analytics, V.K. Jain, Khanna Publishing House

Windows Mobile Application Development

Unit-I

INTRODUCTION TO WINDOWS 8 APPLICATION DEVELOPMENT - brief history of windows application development, History of APIs and Tools, Operating System Input Methods

The Windows Charm Bar, Start Button, Search Button, Share Button, Devices Button, Settings Button, Windows Desktop, Switching between Desktop Programs

WINDOWS 8 ARCHITECTURE FROM A DEVELOPER'S POINT OF VIEW - Windows 8 Development Architecture, Desktop Application Layers, Understanding Windows Runtime: Windows Runtime Architecture Overview, Metadata in Windows Runtime, .NET Framework 4.5: The Installation Model of .NET Framework 4.5, Window Runtime Integration, Picking the Appropriate Technology for Your Project, Choosing a Programming Language

GETTING TO KNOW DEVELOPMENT ENVIRONMENT - Introducing the Toolset, Visual Studio IDE:

Creating a New Project, Lighting Up Your Applications with Expression Blend

UNIT-II

PRINCIPLES OF MODERN WINDOWS APPLICATION DEVELOPMENT - Windows 8 Style Application, Windows 8 Design Language, Introduction to Asynchronous Programming, Evolution of Asynchronous, Programming on the .NET Platform

CREATING WINDOWS 8 STYLE APPLICATIONS WITH HTML5, CSS, AND JAVASCRIPT - HTML5 and CSS on the Web, HTML5 Technologies, HTML5 Applications on Windows Runtime, The Windows Library for JavaScript (WinJS), Creating Windows 8 Style Applications with JavaScript, Accessing the Filesystem, Managing Data, Respecting the User's Device

UNIT-III

USING XAML TO CREATE WINDOWS 8 STYLE USER INTERFACES - Describing the User Interface Using XAML, Using Namespaces, Understanding the Layout Management System, Reusable Resources in XAML, Basic Controls in Windows 8 Style Applications: Controls with Simply Accessing the Internet: e Values, Content Controls, Working with Data: Data Binding Dependency Properties and Notifications, Binding Modes and Directions

WORKING WITH XAML CONTROLS - Using Animations in Application, Designing the Visual Look of a Control, Working with Complex Controls: Getting to Know the List View Base Controls, Using the Grid View Control, Binding to Data, Grouping Data, Defining Visual Groups

BUILDING WINDOWS 8 STYLE APPLICATIONS - The Lifecycle of a Windows 8 Application, Deploying Windows 8 Apps, Commanding Surfaces, Persisting Application Data, Applications and the Start Screen

UNIT-IV

CREATING MULTI-PAGE APPLICATIONS - Navigation Basics, working with Pages, Using the Split Application and Grid Application Templates

BUILDING CONNECTED APPLICATIONS - Integrating with the Operating System and Other Apps: Picker Unified Design to Access Data, Understanding the Concept of Contracts, Accessing the Internet: Detecting the Changes of Internet Connectivity, Using Feeds, Accessing Windows Live LEVERAGING TABLET FEATURES - Accommodating Tablet Devices, Building Location-Aware Applications, Using Sensors: Using Raw Sensor Data, Using Sensor Fusion Data

UNIT-V

ADVANCED PROGRAMMING CONCEPTS - Building Solutions with Multiple Languages: Hybrid Solutions, Background Tasks: Understanding Background Tasks, How Background Tasks Work,

Cancelling Background Tasks, Implementing Background Tasks, creating a Simple Background Task, Managing Task Progress and Cancelation, Input Devices

TESTING AND DEBUGGING WINDOWS 8 APPLICATIONS - The Quality of Software, Becoming Familiar with Debugging, Controlling the Program Flow in Debug Mode, Monitoring and Editing Variables, Changing the Code While Debugging, Windows 8 Style Application-Specific Scenarios, Introduction to Software Testing, Introduction to Unit Testing, Unit Testing Windows 8 Style Applications

INTRODUCING THE WINDOWS STORE - Getting to Know the Windows Store, How Customers See an App in the Windows Store, Application Details, Making Money with Your App, The Developer Registration Process: Submitting the Application, The Application Certification Process, The Windows App Certification Kit.

Introduction to Python Programming

- Familiarization with the basics of Python programming: a simple “hello world" program, process of writing a program, running it, and print statements; simple data-types: integer, float, string

- Introduce the notion of a variable, and methods to manipulate it (concept of L-value and R-value even if not taught explicitly)

- Knowledge of data types and operators: accepting input from the console, assignment statement, expressions, operators and their precedence.

- Conditional statements: if, if-else, if-elif-else; simple programs: e.g.: absolute value, sort numbers, and divisibility.

- Notion of iterative computation and control flow: for, while, flowcharts, decision trees

- and pseudo code; write a lot of programs: interest calculation, primarily testing, and factorials.

- Idea of debugging: errors and exceptions; debugging: pdb, break points.

- Lists, tuples and dictionary: finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary. Introduce the notion of accessing elements in a collection using numbers and names.

- Sorting algorithm: bubble and insertion sort; count the number of operations while sorting.

- Strings: compare, concat, substring; notion of states and transitions using state transition diagrams.

Reference Books:

1. Introduction to Computing and Problem Solving With Python, Jeeva Jose, Khanna Publishing House
2. Taming Python by Programming, Jeeva Jose, Khanna Publishing House

Introduction to Microprocessors

Digital Design and VHDL

Introduction
Combinational Logic
Structural Modeling
Sequential Logic
Finite State Machines
Parameterized Modules
Testbenches

Arithmetic Logic Unit (ALU)

1. Introduction
2. Arithmetic Circuits
3. ALU
4. Number Systems

Microprocessor I: Instruction Data Set. Machine Language

1. Introduction
2. Assembly Language
3. Machine Language
4. Programming
5. Addressing Modes
6. Lights, Camera, Action: Compiling, Assembling, and Loading
7. Odds and Ends

Microprocessor II: Control and Datapath Design. Single-Cycle Processor

1. Introduction
2. Performance Analysis
3. Single-Cycle Processor

Microprocessor III: Control and Datapath Design. Multi-cycle Processor

1. Introduction
2. Performance Analysis
3. Multicycle Processor
4. Pipelined Processor

Memory systems and I/O.

Introduction
Memory System
Caches
Virtual Memory
Memory-Mapped I/O
Memory map
I/O Devices
Buses and organization

Reference Books:

1. Fundamentals of Microprocessor, M.K. Ghodki, Khanna Publishing House
2. Advance Microprocessor, A.K. Gautam, Khanna Publishing House

Windows Mobile Application Development Lab

1. Working with J2ME Features
2. Threads & High level UI
3. Developing networked applications using the wireless toolkit
4. Authentication with a webserver
5. Study Windows API's. Find out their relationship with MFC classes. Appreciate how they are helpful in finding complexities of windows programming.

Python Programming Lab

1. Python Program to Print Hello world!
2. Python Program to Add Two Numbers
3. Python Program to Check if a Number is Odd or Even
4. Python Program to Solve Quadratic Equation
5. Python Program to Check Armstrong Number
6. Python Program to Find the Sum of Natural Numbers
7. Write a Python program to get unique values from a list
8. Python Program to Illustrate Different Tuple Operations
9. Python Program to Check Whether a String is Palindrome or Not
10. Write a Python program to remove duplicates from Dictionary
11. 1. Write a Python program to sort a list alphabetically in a dictionary
12. 2. Python Program to Illustrate Different Set Operations (Union, Intersection, Difference and Symmetric Difference)
13. Python Program to illustrate the concept of Binary Relations in Set.
14. Python Program to Generate a Random Number
15. 5. Python Program to Convert Decimal to Binary, Octal and Hexadecimal
16. 6. Python Program to Find HCF or GCD
17. Given two integers x and n, compute x^n.
18. Python Program to Find Factors of Number
19. Python Program to Make a Simple Calculator
20. Python Program to Find Factorial of Number Using Recursion

Level 7 (Semester VI)

Introduction to AI

UNIT – I

Overview of A.I: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success. Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem Heuristic search techniques : Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

UNIT - II

Knowledge Representation: Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation. Using Predicate Logic: Represent ting Simple Facts in logic, Representing instances and is-a relationship, Computable function and predicate.

UNIT - III

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing. Learning: Introduction learning, Rote learning, Learning by taking advice, Learning in problem solving, Learning from example-induction, Explanation based learning.

UNIT - IV

Expert System: Introduction, Representing using domain specific knowledge, Expert system shells. Knowledge acquisition: General concepts in knowledge acquisition, early work in Machine Learning, examples of Inductive Learners, computer vision, Robotics, overview of LISP- AI language.

Reference Books:

1. Artificial Intelligence, Munish Chandra Trivedi, Khanna Publishing House

OR

Computer Network Security

UNIT-I

Network Concept, Benefits of Network, Network classification (PAN, LAN, MAN, WAN), Peer to Peer, Client Server architecture, Transmission media: Guided & Unguided, Network Topologies. Networking terms: DNS, URL, client server architecture, TCP/IP, FTP, HTTP, HTTPS, SMTP, Telnet OSI and TCP/IP Models: Layers and their basic functions and Protocols, Comparison of OSI and TCP/IP. Networking Devices: Hubs, Switches, Routers, Bridges, Repeaters, Gateways and Modems, ADSL.

UNIT-II

Ethernet Networking: Half and Full-Duplex Ethernet, Ethernet at the Data Link Layer, Ethernet at the Physical Layer. Switching Technologies: layer-2 switching, address learning in layer-2 switches,

network loop problems in layer-2 switched networks, Spanning-Tree Protocol, LAN switch types and working with layer-2 switches, Wireless LAN

UNIT- III

Internet layer Protocol: Internet Protocol, ICMP, ARP, RARP. IP Addressing: Different classes of IP addresses, Sub-netting for an internet work, Classless Addressing. Comparative study of IPv4 & IPv6.Introduction to Router Configuration.Introduction to Virtual LAN.

UNIT- IV

Transport Layer: Functions of transport layer, Difference between working of TCP and UDP.
Application Layer: Domain Name System (DNS), Remote logging, Telnet, FTP, HTTP, HTTPS.
Introduction to Network Security.

Reference Books:

1. Information & Computer Security, Sarika Gupta, Khanna Publishing House
2. An Integrated Approach to Computer Networks, BhavneetSidhu, Khanna Publishing House

e-Commerce

Unit I

Introduction E-Business: Origin and Need of E-Commerce, Factors affecting E -Commerce, Business dimension and technological dimension of E-Commerce, E-Commerce frame work Electronic Commerce Models, Value Chains in Electronic Commerce.

Unit II

Internet and E-Business: Introduction to Internet and its application, Intranet and Extranets. World Wide Web, Internet Architectures, Internet Applications, Business Applications on Internet, E - Shopping, Electronic Data Interchange, Components of Electronic Data Interchange, Creating Web Pages using HTML.

Unit III

Technology for Online Business: Internet, IT Infrastructure, Middleware Contents, Text and Integrating E-Business Applications, Mechanism of Making Payment Through Internet, Online Payment Mechanism, Electronic Payment Systems, Payment Gateways, Visitors to
Software Development Website, Tools for Promoting Website, Plastic Money, Debit Card, Credit Card, Laws Relating to Online Transactions.

Unit IV

Applications in E-commerce: E-commerce Applications in Manufacturing, Wholesale, Retail and Service Sector.

Reference Books:

1. E-Commerce, Sarika Gupta, Khanna Publishing House

OR

Introduction to Biometrics

Unit I

Concepts - biometric recognition, biometrics, requirements for biometrics
Biometric systems, their modes and architectures, Biometric system errors and evaluation, Software Development

Unit II

Overview, comparison and evaluation of various biometrics
Unimodal biometric systems, their advantages, disadvantages and limits
Multimodal biometric systems, their modes of operation, levels of fusion

Unit III

Biometric pattern recognition methods
Privacy protection and social acceptance
Biometric standardization, data formats
Design and implementation of biometric systems, applications of biometric systems, biometric databases, security of biometric systems

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Graphics & Multimedia(GM)
Branch code:107

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME

Graphics & Multimedia

Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BGMV511	Web Applications	30	10	5	5	20	30		**50**	**2**
2	BGMV512	Communication Skill-I	30	10	5	5	20	30		**50**	**2**
3	BGMV513	Graphic Design (Basic Sketching and Human Anatomy in Drawing)	30	10	5	5	20	30		**50**	**2**
4	BGMV514	Illustration And Photo-Editing	30	10	5	5	20	30		**50**	**2**
6	BGMP511	Web Applications –Lab	30				20		30	**50**	**1**
7	BGMP512	Illustration And Photo-Editing –Lab	30				20		30	**50**	**1**
8	BGMP513	Language Lab	30				20		30	**50**	**2**
9	BGMT511	Character Designer MES/Q0502						Any one Training 400 hrs / 8 weeks		**150**	**12**
	BGMT512	Storyboard Artist MES/Q0507									
	BGMT513	Editor MES/Q1401									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BGMV521	Pre-Production	30	10	5	5	20	30		**50**	**2**
2	BGMV522	Audio Editing	30	10	5	5	20	30		**50**	**2**
3	BGMV523	Video Editing	30	10	5	5	20	30		**50**	**2**
4	BGMV524	Communication Skill- II	30	10	5	5	20	30		**50**	**2**
6	BGMP521	Audio Editing-Lab	30				20		30	**50**	**1**
7	BGMP522	Video Editing-Lab	30				20		30	**50**	**1**
8	BGMP523	IT Tool Lab	30				20		30	**50**	**2**
9	BGMT521	Any one of the QP's can be opted as offered in Semester I						Any one Training 400 hrs/ 8 weeks		**150**	**12**
Total			**610**							**500**	**24**

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV631	Principles of Animation and Techniques of Animation	30	10	5	5	20	30		50	2
2	BGMV632	Basic of 3-D Modelling	30	10	5	5	20	30		50	2
3	BGMV633	Texture and Lighting	30	10	5	5	20	30		50	2
4	BGMV634	Communication Skill-III	30	10	5	5	20	30		50	2
5	BGME631	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BGMP631	Digital Animation with Flash - Lab	30				20		30	50	1
7	BGMP632	Maya – Lab	30				20		30	50	1
8	BGMT631	Modeller MES/Q2501						Any one Training 400 hrs/ 8 weeks		150	12
	BGMT632	Animator MES/Q0701									
	BGMT633	Rendering Artist MES/Q3503									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV641	3 D Animation	30	10	5	5	20	30		50	2
2	BGMV642	Introduction to 3 D Motion Graphics & VFX	30	10	5	5	20	30		50	2
3	BGMV643	Introduction to Rendering	30	10	5	5	20	30		50	2
4	BGMV644	Communication Skill-IV	30	10	5	5	20	30		50	2
5	BGME641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BGMP641	3 D Animation Lab	30				20		30	50	1
7	BGMP642	Rendering-Lab	30				20		30	50	1
8	BGMT641	Any one of the QP's can be opted as offered in Semester III						Any one Training 400 hrs/ 8 weeks		150	12
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV751	Digital Compositing	30	10	5	5	20	30		50	2
2	BGMV752	3 D Texturing	30	10	5	5	20	30		50	2
3	BGMV753	Basic of Accounts-I	30	10	5	5	20	30		50	2
4	BGMV754	Computer Graphics	30	10	5	5	20	30		50	2
5	BGME751	Indian Constitution / Essence of Indian Traditional knowledge	30								2
6	BGMP751	Digital Compositing-Lab	30				20		30	50	1
7	BGMP752	3 D Texturing –Lab	30				20		30	50	1
8	BGMT751	Compositor MES/Q3505						Any one Training 400 hrs/ 8 weeks		150	12
	BGMT752	Texturing Artist MES/Q2503									
	BGMT753	Rigging Artist MES/Q2502									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV761	Muscle System	30	10	5	5	20	30		50	2
2	BGMV762	Rigging	30	10	5	5	20	30		50	2
3	BGME761	Indian Constitution / Essence of Indian Traditional knowledge	30	10	5	5	20	30		50	2
4	BGMP761	Major Project	180					30	150	150	6
5	BGMT761	Any one of the QP's can be opted as offered in Semester V						Any one Training 400 hrs/ 6 weeks		200	12
Total			670							500	24

Detailed Curriculum

Software Requirements to run the B. Voc (Graphics and Multimedia)

1. Adobe Illustrator (Vector graphic design software)
2. Adobe Photoshop
3. Sound Forge
4. Adobe Premiere Pro
5. Autodesk 3DS Max
6. Autodesk Maya
7. ZBrush

Level 5 (Semester I)

Web Applications

Bridge Course

Introduction to Database Management

Introduction to database concepts and its need

Database Terminology: Data, Record/Tuple, Table, Database, field/attribute

Networking And Open Standards

Computer Networking: Evolution of Networking: ARPANET, WWW, Internet

Network Topologies: Bus, Star, Tree

Types of Network: PAN, LAN, WAN, MAN

Web Page Development

Review of HTML/DHTML, JavaScript covered in Class XI

Installation and Managing WEB-Server: IIS/XAMPP/LAMP

Movie Editing Tools.

1. Familiarization of interface components.
2. Importing pictures.
3. Importing Audio and Video Files.
4. Splitting and Joining Movie Clips.
5. Adding Titles and publishing.
6. Compatible Multimedia file formats for Web Pages.
7. Embedding Audio file.
8. Embedding Video file.
9. Embedding Flash file.
10. Java Script review.
11. Functions – user defined.

12. String Object.
13. Math Object.
14. Array Object.
15. Events.
16. Case Studies.
17. Advanced Features of Web Design.
18. Code view, Add-ins / Snippets and Page Transitions.
19. Dynamic Web templates.
20. SEO - Search Engine Optimization.
21. Forms - Advanced.
22. Publishing webpages or websites-I.

Reference Books:
1.Internet & Web Development, Soma Das Gupta, Khanna Publishing House

Communication Skill -I

Communication Process: The magic of effective communication; Building self-esteem andovercoming fears; Concept, nature and significance of communication process; Meaning, types andmodels of communication; Verbal and non-verbal communication; Linguistic and non-linguisticbarriers to communication and reasons behind communication gap/ miscommunication.

Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses;Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns andantecedents, adjectives, adverbs and articles;

Reference Books:
1. Effective Commmunication Skills, Kulbhushan Kumar, Khanna Publishing House

Graphic Design(Basic Sketching and Human Anatomy in Drawing)

Bridge Course

Design Processes and Practices

Role of Design in Society, Functions of Design, Implications and Impact of Graphic Design Role of Graphic Designer , Contemporary Graphic Design in India , Graphic Design Processes Methodology of Graphic Design

Principles and Elements of Design

Sketching and Drawing, Introduction to Drawing: an aid in visual representation, Types of drawing
Drawing from memory and imagination
Drawing from observation
Drawing from Dimensional information, Virtues of drawing, Colour, Colours theories, Colour wheel, Colour Harmonies or Colour Schemes, Colour Symbolism

Media and Design

Digital Imaging and Printing,Types of Digital Images, Digital image Editing, Digital Printing Advertising Design, What is Media Planning, Campaign Design, Kinds of Campaign , Planning a Campaign Research & Data Collection

Unit I:

Orientation into visual art form. The Basics of traditional 2D animation, Introduction to the skill required thereof, beginning life drawing, Use of simple shapes. How to draw sketches with the help of basic shapes Learning to draw lines, circles, ovals, scribbles, zigzag (random) patterns etc. Background elements, trees, mountains, clouds, water bodies, meadows, perspective drawing Lights and shadows day night scenes, layers (concept and implementation) layout design and staging. An intro on how to make drawings for animation, shapes and forms, about 2D and 3D drawings, Caricaturing-fundamentals, Exaggeration, Attitude, Silhouettes, Boundary breaking exercises and warm-ups.

Unit II:

HUMAN ANATOMY: Structure of man, proportion of body parts, drawing from basic form, Line of action, balance Rhythm, turnings, twisting, drawing plane surfaces, torso, face, eyes, nose, ears, mouth, hand and feet.

FEMALE ANATOMY: Proportion and construction of female body, twisting of female body, chest, torso, face, parts of face, hands, hands in action, feet and gestures, curves, curls, rhythm and twist.

CHILD ANATOMY:Understanding child's figure, proportion and construction of child body, face, chubbiness, hand, feet and gestures.

ANIMAL ANATOMY: Animals from basic forms, understanding motion and grace of animals, turning animals to character, face, legs, tails, perspectives.

CARTOON ANATOMY: Understanding cartoon characters, drawing from basic shapes, line of action, distortion of proportion, cartoon faces, eyes, mouths, hairs, nose, hands, feet, gestures and poses.

Reference Books:

1. Internet and Web Technology, Soma Das Gupta, Khanna Publishing House

Illustrations and Photo Editing

UNIT – I

Introduction to Adobe Illustrator: Introduction to Adobe Illustrator, work area and workspaces and tools. Opening files, importing art work, viewing art work, rulers and grids, Drawing in Illustrator, drawing lines and shapes, pencil tool, pen tool, editing drawing, tracing, symbols, colouring, applying colours, swatches, adjusting colour and colour settings.

UNIT – II

Painting with Illustrator, fills, strokes, brushes, transparency, blending, gradient, meshes and color blending. Selecting, transformation, scaling, grouping, reshaping, cutting, blending of object, creating 3D object, text and typing, special effects, filters, shadows, glow, feathering graphic styles.

UNIT – III

Photoshop and its interface, Navigation and All tools, Working with basic selections, advanced selections-1(on the basis of channels, color range, extract, filter etc), Exercises on selections, Quick Masks, Layer Mask, Vector Mask, Layers & Layer Blending Modes, Play with Photoshop, Filter Gallery, Exercises, Bring some object and try to make it in computer, Make your own cartoon character.

Color Theory, Make a perfect cropping of some images using Photoshop, Prepare a cut-out of some images using Photoshop, Place nice background for those images, Prepare nice background using gradient tool, Scan various images, Color adjustment of those images (PHOTO RETOUCHING).

UNIT – IV

Make Nature scene (winter) digital painting, Make Nature scene (summer) digital painting. Make digital painting (Use brush, pencil, smudge etc), Make something like modern art keeping in mind color combination, make a collage of Indian art and culture. Make a collage of wildlife animals, Make a portrait of celebrity (Digital painting).Convert a B&W image into color (Use variation), "Choose a theme (Music, Festivals, Sports, Dance) and Design 5-8 graphics on them.", Color Modes, Color Corrections, Advanced color correction techniques (levels, Curves, Hue, Saturation etc), Design that Ad from your own style. Design motifs tribe art, Make an animal character, "Plan a story of that character & Make its backgrounds in three/four frames", Make posters on nature/earth, Matte Painting- Composition, Creating images for the web: Exporting images from Photoshop.

Reference Books:

1. Learning Illustrator, Ramesh Bangia, Khanna Publishing House

Web Applications Lab

- Movie Editing Tools
- Customizing and Embedding, Multimedia Components in Web Pages.
- Web Scripting - Java Script.

Illustration and Photo-Editing-Lab

- Script breakdown
- Storyboards
- Costume acquisition
- Sets and Properties design and sourcing
- Location recce and hire
- Location permissions and legal requirements, permissions from civic authorities
- Equipment requirements and bookings
- Travel and Transport
- Catering for crew
- Hospitality for out of town shoots

Level5 (Semester II)

Pre-Production

- Research, brainstorming & story concept creation: Intention / purpose & audience (what you intend to say & why)
- Story structure & character development: Narrative structure and character back story
- Sequence & shot analysis: Analysis and re-creation of timing and shot composition from professionally produced film/video productions
- Storyboards: Visual design (layout/composition, style, color, lighting etc.); Language of cinema (narrative structure, shot composition, spatial/directional continuity)
- Animatics / pre-viz: Timing and transitions Audio layering (music, ambient sound, narration) Budgeting and planning: Consideration of schedules, costs and other planning issues

Audio Editing

UNIT – I

Sonic Sound Forge: Manipulating audio: Auto trim/crop, mute, DC offset, resample, reverse, smooth/enhance, Fade in/out, insert silence, bit depth converter etc, understanding various digital audio formats like .WAV, .AIFF, .MP3, swf, WMA etc, understand audio plug-in, importing and exporting into multiple audio file formats like MP3, real audio, QuickTime formats, etc.

Event tool: move, split, slip and trim multiple events, create fades, apply ASR (Attack/Sustain/Release).Understanding script editor window, Spectrum analysis tools, scrub tool etc, statistics tool (Max, RMS, DC offset, zero crossings), sampler tool etc, Audio editing: workflow, real time editing, event based editing, waveform volume and pan envelopes, Edit, record, encode and master digital audio, editing audio by drag and drop options, cross fading audio tracks, balancing sound levels, creating smooth fades etc.

UNIT – II

Understanding Multichannel audio recording, synchronize audio and video. Understanding regions and play lists, editing of fields, name markers, loops, and regions, Timing basis: absolute frames, measures and beats, Time and frames. Audio effects like: Equalizer, Volume, chorus, distortion, Delay/echo, pitch, bend/shift, reverb, vibrato, normalize etc Insert track markers, adding multiple tracks, adjusting track time, musical instrument file processing

Reference Books:

1. Audio & Video Systems, Bali & Bali, Khanna Publishing House

Video Editing

- Adobe Premiere: Concept of non-linear editing,
- The basics of editing: Overview, Importing and Exporting: various audio, video and graphics in various formats, Edit, manipulate and arrange these elements in visual timeline, understand all Tools of toolbox for editing clips. Titling and superimposing.
- Panels: Tools panel, Project,
- Monitors: Source and program, Timeline, Audio meters,
- Misc. Tasks and functions: Titles, Transitions, speed and duration, Effects, Key frames, Types of edit, Opacity, trimming,
- Adding Special effects like: Star trek transporter effect, Blur part of an image, Ghost effect, Highlight part of an image etc.

Reference Books:

1. Audio & Video Systems, Bali & Bali, Khanna Publishing House

Communication Skill-II

Communication Process:

Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precise writing/abstracting/summarizing; Style of technical communication Curriculum vitae/resume writing;Innovative methods to enhance vocabulary, analogy questions.

Structural and Functional Grammar:

Agreement of verb with the subject: tense, mood,voice; Writing effective sentences; Basic sentence faults;

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

Audio Editing Lab

Using Editing Software – editing basics and implementation of various techniques used in non-linear editing. Mastering final edit line – audio levels, colour correction, audio mixing, mixed and un-mixed versions, importing and applying compatible graphics files. Understanding compression and its affects along with various methods.

Video Editing Lab

1. Assisting Production department on shoot
2. Assisting Direction department on shoot
3. Assisting Art department on shoot
4. Assisting Camera department on shoot
5. Assisting Sound department on shoot

Level 6 (Semester III)

Principles of Animation and Techniques of Animation

UNIT – 1

Drawings with the help of basic shapes, Animal study, Human anatomy, Shading techniques, Live model study, Introduction- Importance of confidence, Difference between "looking at the drawing" and "seeing the drawing", What is observation, Procedure- How to approach, Importance of Guideline- Line of action, Overcome the fear, Drawing for animation,

UNIT – 2

An Introduction on how to make drawings for animation, Shapes and forms, About 2d and 3d drawings, Caricaturing – fundamentals, Exaggeration, Attitude, Silhouettes, Boundary- breaking exercises and warm ups, gesture drawing, Line drawing and quick sketches, Drawing from observation, memory and imagination.

UNIT – 3

Drawing for Animation, Exercises and warm ups on pegging sheet, Quick Studies from real life, Sequential movement drawing, caricaturing the Action. Thumbnails, Drama and psychological effect,

Motion Studies, Drawing for motion,

UNIT – 4

The Body language, Re-defining the drawings, Introduction to animation production process, Basic Principles in animation, Squash and stretch, Anticipation, Staging, Straight ahead and pose to pose, Follow through and overlapping action, Slow in and slow out, Arcs, Secondary action, Timing, Exaggeration, Solid drawing, Appeal, Mass and weight, Character acting, Volume, Line of action, Path of action, Walk cycles-animal and human.

Reference Books:

1. Multimedia and Animation, V.K. Jain, Khanna Publishing House

Basic of 3-D Modelling

UNIT – I

Interface of 3DS max, Understanding the concept of four view ports, Aligning object in the each view port in X, Y, Z axis, Hot keys, User defined hot keys, Using the menus, Floating and docking. Command panel, customizing the interface, Using drag and drop feature, Introduction to different workspaces, "Geometry, Sub objects, Extruding, Welding, bridging etc, Recognizing the workspaces".

UNIT – II

Introduction to standard and extended primitives. "Introduction to creating complex objects with Standard and extended primitives", Understanding the spline tools. Introduction to polytools. Using modifier stack, navigating the modifier stack, File navigation, Introduction to Connection (Hierarchy, Group, and Link).

UNIT – III

Introduction to the 3d elevators and walk through, "Introduction to modifiers and modifier gizmos, Familiarity with Modifiers like Bend, edit poly, X form, wave, lathe symmetry etc

UNIT – IV

Advanced 3DS Max, Modelling objects with lathe, loft, extrude etc, Creating 3D objects from 2D spline shapes, Organic and inorganic modelling

Texture and Lighting

Unit I:

Introduction to texturing, working with Diffuse, Opacity and Reflection, Basics of UV unwrapping, Creating texture maps, Bump and Displacement Mapping, Introduction to Video post, Introduction to standard lights.

Reference Books:

1. Mastering Photoshop, WebTech Solutions, Khanna Publishing House

Communication Skills III

UNIT-I Recognizing and Understanding Communication Styles: What is Communication, Passive Communication, Aggressive Communication, Passive-Aggressive Communication, Assertive Communication, Verbal and Non Verbal Communication, Barriers and Gateways to Communication.

UNIT-II Listening Skills: Types of Listening (theory /definition), Tips for Effective Listening Academic Listening- (lecturing), Listening to Talks and Presentations, Basics of Telephone Communication Writing Skills: Standard Business letter, Report writing, Email drafting and Etiquettes, Preparing Agenda and writing minutes for meetings, Making notes on Business conversations, Effective use of SMS, Case writing and Documentation

UNIT-III Soft Skills: Empathy (Understanding of someone else point of view), Intrapersonal skills, Interpersonal skills, Negotiation skills, Cultural Aspects of Communication.

UNIT-IV Group Communication: The Basics of Group Dynamics, Group Interaction and Communication, how to Be Effective in Groups, Handling Miscommunication, Handling Disagreements and Conflicts, Constructive Criticism

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

Digital Animation with FlashLab

- Data management in postproduction.
- Setting up and preparing editing rooms and sound editing rooms
- Logging of rushes
- Assisting in rough cuts
- Assist in editing line-up
- Assist in synchronizing visuals and dialogue
- Assist in recording and matching sound effects

Maya Lab

- Navigate the Maya interface
- Access your objects in the Maya scene graph
- Use the Maya polygon and NURBS modeling tools
- Shade and apply texture maps to objects inside of Maya
- Union: Region belonging to one or both polygons
- Intersection: Region belonging to both polygons
- Difference: Region belonging to first but not second
- Polygon Texturing

Level 6 (Semester IV)

3D Animation

Unit I: Body Mechanics

Students learn to use principles of traditional animation within the context of 3D animation by effectively applying them onto the character.

Part of good acting for animation is planning. The students learn to create or collect authentic visual references (both still and video) for animating body mechanics and understanding acting. Good poses are not only essential to create believable physicality but also it helps to clearly convey the character emotion for storytelling. They learn the importance of balance and weight, checking the silhouette all the time to make clearer poses.

They learn to act out body mechanics, learn the effect of physics (gravity/friction etc.) and artistic Presentation (composition, staging, silhouette etc.)

Students learn to convey Emotion not only in the facial expression but also in the body language.

Unit II: Facial Expression and Lip Sync

Foundation of good facial expression depends upon the reference and pre-planning. Detailed expression chart and voice recording is used as a starting point for any facial animation. Students learn to internalize the dialogue and they rehearse the sounds to match the shapes. They also need to draw out key poses before starting to pose in 3D.
A good animator needs more skillset than just to be able to animate how to createlip-synch. Students explore how to create the subtle facial expressions to suit the personality of the character and the accent style of the pre-recorded dialogue.

Unit III: Animation and the Body
Exploration of the diverse ways in which the human form takes shape in animated films, from highly photorealistic representations to stream-of-consciousness movement. Specific examples from 2D, 3D, stop-motion and hybrid work will be examined in order to shed light on the construction and animation of the body in contemporary film.

Reference Books:

1. Multimedia and Animation, V.K. Jain, Khanna Publishing House

Introduction to 3 D Motion Graphics & VFX

UNIT – I

Concepts for Broadcast animation for logos, channel IDs and montages, Multi-layer compositing, Special effects, Super imposition and titling, Exporting various file formats outputs as per the end user requirements.

UNIT – II

Introduction to batch render & work group, Adding cameras & lights to a simple scene to make a complex compositing, Adding 2D back ground and elements into a 3D character layers, Creating object, material IDs for further adding special effects, Effects for digital video 2D layers and 3D layers for more effective outputs, adding particle effects into a scene.

UNIT – III

Introduction to colour character and keying, "Editing the real time video with CG based scene and merging both of them to create a final output, Exporting various file format, output as per the end user requirements.

UNIT – IV

Introduction to the batch rendering and work groups, Introduction to the concepts of editing in terms of compositing, Adding special effects in built in compositing software to make a simple shot into a perfect output.

UNIT – V

Chroma keying, Luma key, Blue screen, Key frame text & layer animation & 3D particles, Effects etc. Color correction, Introduction to 3D compositing concepts i.e. Layers and masking, Rot scoping, Rig removal, Morphing.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House

Introduction to Rendering

Unit I:

This unit teaches students about rendering concepts; formats and resolutions.

Unit II:

This unit teaches students the advantages of different render software such as mental ray, v-ray, render man etc.

Unit III:

This unit teaches students the benefits of layer based rendering. This process enhances theimage quality without need of re-rendering the images again.

Unit IV:

The rendered layers or passes need to be composited to get the final output.

Communication Skills IV

Forms of non-verbal communication; interpreting body-language cues; Kinesics; Effective use of body language. The presentation and oral communication skill will be imparted through Group Discussion, Differences between group discussion and debate; Presentation Skills, Oral presentation and public speaking skills; The course also includes training and skill of Technology-based Communication, power-point presentation. Activities/tasks like role playing, group discussion, public speaking, extempore presentation and interviews will be conducted on regular basis.

Writing Skills: The activities will include: Writing Task: identifying the focus, generating ideas, outlining, etc. Paragraph Structure and Linking Sub-points in a Paragraph Cohesion and unity in a paragraph, Minding Punctuation and Proofreading, Summarising, Reviewing and Aspects of Creative Writing. Activities / tasks to be conducted like paragraph writing, essay writing, writing a review of a literary text, writing a summary of a literary text, comprehension and analysis of a literary text, preparing an advertisement.

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

3D Animation Lab

- Assist in laying background music tracks
- Assist in mixing and mastering video
- Assist in creating titles and subtitles and basic animation sequences
- Understand and assist in the execution of modelling and rendering in 3D animation software.

3D Rendering Lab

Introduction to Scene, Preparing the Scene, Basic Settings for Texturing, Create & Assign Textures, Light Setup, V-Ray Rendering Settings

- Rendering with V-Ray
- V-ray light setup
- V-ray rendering settings
- HDRI Illumination
- Fine-tuning shadows
- Final render setting

Level 7 (Semester V)

Digital Compositing

- Introduction to Compositing software
- Principles of compositing
- Basic techniques
- Transparency
- Rotoscoping
- Wire Removal
- Chroma key
- Layer based compositing
- Compositing modes
- Animating layers

3D Texturing

UNIT – I

Introduction to basic material types & Procedurals. Study of concepts: Opacity, Smoothness, Specularity, and color, Working with Maya Surface Nodes-Blinn, Phong & Lambert, Working with Transparency, Reflection & Refraction, Bump & Displacement Maps, Introduction to unwrapping, Unwrapping the maps for various 3D characters.

UNIT – II

Working with 2D and 3D Texture, Introduction to the mapping and advanced texturing techniques, Shadow maps; ray traced shadows and radiosity, Creating photo real environments and textures, Basics of Utilities-Reverse, Stencil, Condition, Sampler Information.

Basic of Accounts-I

Chapter 1:

- Define the accounting process
- Describe the role of accountants
- Explain accounting concepts and principles
- Discuss the concept of the accounting equation
- Use the accounting equation to analyze basic transactions in terms of increases and decreases
- Reporting financial information on a balance sheet

Chapter 2:

- Determine how transactions change owner's equity in an accounting equation
- Reporting a changed accounting equation on a balance sheet

Chapter 3:

- Analyze transactions using T-accounts and using debits and credits
- Use debits and credits to record increase and decreases in accounts

Chapter 4:

- Record journal entries in a 5-column journal
- Define accounting terms related to journalizing transactions
- Prove and rule a five-column journal and prove cash

Chapter 5:

- Prepare a chart of accounts and opening accounts
- Post separate amounts from a journal to a general ledger
- Post column totals from a journal to a general ledger
- Make correcting entries

Chapter 6:

- Reconcile a bank statement and record bank service charges, dishonoured checks, and petty cash transactions

Computer Graphics

UNIT-I Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices. Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood fill algorithms.

UNIT-II 2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III 3-D Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygonrendering methods.

UNIT-IV 3-D Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping

Reference Books:

1. Computer Graphics, Rishabh Anand, Khanna Publishing House
2. Computer Graphics, Gautam Roy, Khanna Publishing House

Digital Compositing Lab

- 2D animation preproduction
- 2D character design
- 2D environment and background layout
- Motion graphic sequences

3D Texturing Lab

1. Applying Texture for inorganic polygon models- I

(Lamps, Mobile, Planet, Land with grass texture, rock, atmospheric objects system)

2. Applying Texture for organic polygon models – I (Cartoon, Semi cartoon)
3. Applying Texture for inorganic polygon models - II (Solar system, Car, Bike, Plane)
4. Applying Texture for organic polygon models - II (Human, Animal)
5. Applying Texture for organic Subdivision models – I (Cartoon, Semi cartoon)
6. Applying Texture for inorganic Subdivision models - II (Solar system, Car, Bike, Plane)
7. Applying texture for rendering final output with organic and inorganic objects

Level7 (SemesterVI)

Muscle System

Unit I:

Introduction to bone system/Joints and IK handles, creating bone system and maintaining naming conventions,

Unit II:

Skinning: types, import and export of skin weights, IK and FK basics, IK and FK switch, stretchy IK and FK,

Unit III:

Introduction to Deformers: attics, wrap, cluster, riggle, wire etc. Use of deformers in rigging process.

Rigging

UNIT –I

Introduction to constraints and implementation to rigging, Maintaining proper hierarchy, grouping and creating controls, Rigging the characters, Introduction to Muscle system, Working with Muscle rigging, Introduction to automated rigging systems and methods.

UNIT – II

"Embedding small scripts in the hierarchy control system, to save time and facilitate handling", Advanced rigging, Vertex weighting techniques, Rigging solutions to Anatomical Problems, Using advanced rigging to archive natural articulation of character.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Banking Finance Services and Insurance (FS)
Branch Code:108

Based on
AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME
Banking Finance Services and Insurance (BFSI)

BFSI Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BFSV511	Banking & Micro Finance - I	30	10	5	5	20	30		50	2
2	BFSV512	Indian Securities Markets - I	30	10	5	5	20	30		50	2
3	BFSV513	Micro Finance Operations - I	30	10	5	5	20	30		50	2
4	BFSV514	Mutual Fund Operations - I	30	10	5	5	20	30		50	2
5	BFSP511	Vocational Practical –I	30	-	-	-	20	-	30	50	1
6	BFSP512	Vocational Practical –II	30	-	-	-	20	-	30	50	1
7	BFSP513	Language Lab	30	-	-	-	20	-	30	50	2
8	BFST511	Insurance Agent (BSC/Q3801)						Any one Training 400hrs/ 8 weeks		150	12
	BFST512	Business Correspondent / Business Facilitator(BSC/Q8401)									
	BFST513	Debt Recovery Agent (BSC/Q2303)									
Total			610	-	-	-	-	-	-	500	24

BFSI Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BFSV521	Banking & Micro Finance – II	30	10	5	5	20	30		50	2
2	BFSV522	Indian Securities Markets - II	30	10	5	5	20	30		50	2
3	BFSV523	Micro Finance Operations - II	30	10	5	5	20	30		50	2
4	BFSV524	Mutual Fund Operations - II	30	10	5	5	20	30		50	2
5	BFSP521	Vocational Practical –III	30	-	-	-	20	-	30	50	1
6	BFSP522	Vocational Practical –IV	30	-	-	-	20	-	30	50	1
7	BFSP523	IT Tool Lab	30	-	-	-	20	-	30	50	2
8	BFST521	Mutual Fund Agent (BSC/Q3802)						Any one Training 400 hrs/ 6 weeks		150	12
	BFST522	Small and Medium Enterprise (SME) Officer (BSC/Q2302)									
Total			610	-	-	-	-	-	-	500	24

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.

Electronics Manufacturing Services (EM)
Branch Code:111

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME
Electronics Manufacturing Services

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV511	Electronic Measurement and Instrumentation –I	30	10	5	5	20	30		50	2
2	BEMV512	Identification of Components, Tools, SOP & Work Instructions-I	30	10	5	5	20	30		50	2
3	BEMV513	Tools, Equipment & Safety Measures –I	30	10	5	5	20	30		50	2
4	BEMV514	Soldering & De-Soldering of Components –I	30	10	5	5	20	30		50	2
6	BEMP511	Identification of Components, Tools, Equipment and its working –Lab	30				20		30	50	1
7	BEMP512	Electronic Measurement and Instrumentation -I –Lab	30				20		30	50	1
8	BEMP513	Language Lab	30				20		30	50	2
8	BEMT511	Embedded Software Engineer (ELE/Q1501)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT512	Security System Service Engineer (ELE/Q4610)									
	BEMT513	Systems Analyst (ELE/Q8701)									
	BEMV511	Embedded Software Engineer (ELE/Q1501)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV521	Electronic Measurement and Instrumentation –II	30	10	5	5	20	30		50	2
2	BEMV522	Identification of Components, Tools, SOP & Work Instructions-II	30	10	5	5	20	30		50	2
3	BEMV523	Tools, Equipment & Safety Measures –II	30	10	5	5	20	30		50	2
4	BEMV524	Soldering & De-Soldering of Components & Emergency actions II	30	10	5	5	20	30		50	2
5	BEMP521	Soldering & De-Soldering of Components-Lab	30				20		30	50	1
6	BEMP522	Electronic Measurement and Instrumentation -II (Lab)	30				20		30	50	1
7	BEMP523	IT Tool Lab	30				20		30	50	2
8	BEMT521	Smartphone Assembly Inspector (ELE/Q4001)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT522	Business Development Executive (ELE/Q1101									
Total			610							500	24

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV631	Fault analysis & Repairs	30	10	5	5	20	30		50	2
2	BEMV632	Good Manufacturing Concept & Practices – I	30	10	5	5	20	30		50	2
3	BEMV633	Electronics Devices Circuit –I	30	10	5	5	20	30		50	2
4	BEMV634	Electronics System Packaging and Manufacturing	30	10	5	5	20	30		50	2
5	BEMV635	Univ. Human Val. & Ethics / Environ & Eco	30	10	5	5	20	30		50	2
6	BEMP631	Electronics Devices Circuit –I Lab	30				20		30	50	1
7	BEMP632	Fault analysis & Repairs – Lab +	30				20		30	50	1
8	BEMT631	Field Engineer RACW (ELE/Q3105)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT632	Security System Service Engineer (ELE/Q4610)									
	BEMT633	Pre-Sales Solar Technical Support Engineer (ELE/Q5602)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV641	Good Manufacturing Concepts Practices–II	30	10	5	5	20	30		50	2
2	BEMV642	Manufacturing & Quality Norms	30	10	5	5	20	30		50	2
3	BEMV643	Good Manufacturing Concepts & Practices–III	30	10	5	5	20	30		50	2
4	BEMV644	Electronics Devices Circuit –II	30	10	5	5	20	30		50	2
5	BEMV645	Environ & Eco / Univ. Human Val. & Ethics	30	10	5	5	20	30		50	2
6	BEMP641	Electronics Devices Circuit –II Lab	30				20		30	50	1
7	BEMP642	Manufacturing Practices	30				20		30	50	1
8	BEMT641	Purchase Executive (ELE/Q5701)					Any one Training 400 hrs/ 8 week			150	12
	BEMT642	Quality Engineer (ELE/Q7901									
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV751	Valuation & Storage	30	10	5	5	20	30		50	2
2	BEMV752	Shelf Life, Ware House Operations Management & Material Transactions	30	10	5	5	20	30		50	2
3	BEMV753	Industrial Electronics Product Design	30	10	5	5	20	30		50	2
4	BEMV754	Pre-Production Activities	30	10	5	5	20	30		50	2
5	BEMV755	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BEMP751	Pre-Production Activities-Lab	30				20		30	50	1
7	BEMP752	Valuation & Storage-Lab	30				20		30	50	1
8	BEMT751	Product Engineer (ELE/Q4201)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT752	Incoming QC Technician (ELE/Q4401)									
	BEMT753	Assembly Supervisor (ELE/Q6305)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV761	Entrepreneurship/Accounting/Management	30	10	5	5	20	30		50	2
2	BEMV762	Trouble shooting and Maintenance of Electronics Equipment	30	10	5	5	20	30		50	2
3	BEMV763	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BEMP761	Major Project	180						150	150	6
5	BEMT761	FPGA Design Engineer (ELE/Q8201)					Any one Training 400 hrs/ 8 weeks			200	12
	BEMT762	Sales Executive-Consumer Electronics (ELE/Q3201)									
Total			670							500	24

Detailed Curriculum
Level 5 (Semester I)

Electronic Measurements and Instrumentation-I

Unit, dimensions and standards

Scientific notations and metric prefixes, SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multi-meters, digital frequency meter system.

Electromagnetic Effects

Permanent magnets and Electromagnets, their construction and uses, Polarities of an electromagnet and rules for finding them, Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance. Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Principles and construction of dynamo.

A.C Circuits

Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value R.M.S. value, form factor, crest factor, Phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

Identification of Components, Tools, SOP & Work Instructions-I

1. Main components & modules/ sub-assemblies of electronic equipment
    - Control Panel (System Controller)
    - Keypads
    - Door and Window Contacts
    - Motion Detectors
    - Glass Break Detection
    - Smoke Detectors
    - Heat Sensors
    - Carbon Monoxide Detectors
    - Water Detectors (or Water Bug)
    - Temperature Sensors
    - Capacitance switches / control push buttons & rotary switches

2. Introduction to Basic Electricity

Current Electricity

Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Temperature variation of resistance, Difference between AC and DC voltage and current.

D.C. Circuits
Ohm's Law, Series – parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.

Electric Cells
Primary cell, wet cell, dry cell, battery, Li-ion battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, preparation of electrolyte, care and maintenance of secondary cells.

Lighting Effects of Current
Lighting effect of electric current, filaments used in lamps, and Tubelight, LED, their working and applications.

Capacitors
Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

3. **Introduction and Identification of Electronics Components**
   - Electronic controls in a common way
   - Diode, Transistors, Op-Amp
   - Number systems and Boolean Algebra
   - Logic Gates
   - Flip-Flops
   - Counters
   - Multiplexers
   - Decoders
   - LED, LCD and 7 segment display
   - RAM and ROM
4. Concept of Amplification factor, Gain & Signal distortion
5. Protocols like TCP/IP for communication purpose and for digital networks & circuits.

Tools, Equipment and Safety Measures-I

1. Cables & Connectors
   - Non-Metallic Sheathed Cable
   - Un grounded & Grounded Power Supply Cable
   - Metallic Sheathed Cable
   - Multi-Conductor Cable
   - Coaxial Cable
   - Unshielded Twisted Pair Cable
   - Shielded twisted pair cable
   - Ribbon Cable
   - Armoured & Unarmoured Cable
   - Twin-Lead Cable
   - Twin axial Cable
   - Optical fiber cable
   - Connectors
1. ESD Clothing
   - What to wear, how to wear

Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

Identification of Components, Tools, SOP & Work Instructions-I (Lab)

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.
6. Verification of truth tables for AND, OR, NOT and NAND logic gates.
7. Verification of truth tables for NOR, XOR and XNOR logic gates.
8. Construction and verification of operations of half adder and full adder circuits using basic gates.
9. Study and verification of truth tables for 3 line to 8 line decoder.
10. Study and verification of truth tables for 4:1 MUX using gates
11. Study and verification of truth tables for 1:4 DEMUX using gates.
12. Construction and verification of truth tables for S-R, D and J-K flip flops.
13. Study and verification of truth table for universal shift register.
14. Study the operation of a synchronous counter.

Electronic Measurement and Instrumentation -I (Lab)

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.

Level 5 (Semester II)

Electronic Measurements and Instrumentation - II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter
CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

Identification of Components, Tools, SOP & Work Instructions-II

1 Introduction to wireless communication
2 Signal Converters
3 Tools & their Uses
- Use of tester to monitor AC Power
- Skin the electrical wires/cables using the wire stripper and cutter
- Main cable for control & electronic circuit wires
- Crimping tools and buses

4 Introduction to measuring equipment's
- Signal generator's
- CRO
- Function Generators
- Frequency Counter
- Logic analyzer
- Spectrum analyzer
- LCRQ Meter

5 Standard Operating Procedures and Work Instructions
- What is SOP and WI
- How to read & follow SOP and WI
- Overall Quality Assurance Plan

Tools, Equipment & Safety Measures-II

1. Tools & Equipment
   - Types of tools & equipment required and deployed in manufacturing, installing & servicing
   - Identification and termination process
   - General maintenance of tools/equipment and recalibration of Test equipment
   - General safety and common-sense safety
2. PPE
   - Usage & benefits of PPE

- Types & usage of various PPE
- Maintenance of PPE

2. Clean Room Environment
   - Do's and Don't
   - Shop Floor Discipline

Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components
   - Identification of 2, 3, 4 terminal SMD components
   - Soldering the SMD components on the PCB
   - Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
   - Identify various connections and the setup required for SMD soldering station
   - De solder the SMD components from the given PCB
   - Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
   - Make a panel board using different types of switches for a given application
   - Identification of crimping tools for various IC packages
   - Reliable Soldering Practices

2. Emergency actions
   - Minimum Requirements
   - Reporting Emergencies
   - Emergency exits
   - Primary and secondary evacuation routes
   - Locations of fire extinguishers
   - Fire alarm pull stations' location
   - Assembly points
   - Medical Services

Soldering & De-soldering of components - II Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

Electronic Measurement-II Lab

1. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Pressure transducer
2. Measurement of phase difference and frequency using CRO (lissajous figure)
3. Measurement of low resistance Kelvin's double bridge.
4. Radio Receiver Measurements

Level 6 (Semester III)
Fault Analysis & Repairs

1. Classification of fault
2. Identification of fault
3. Rectification of fault
4. Repairing/Replacing Module
5. Analysis for the different types of equipment's
   - Smartphones
   - Air Conditioning
   - Security systems
   - Electronically controlled doors
6. Fault analysis based on hardware and software component
7. Diagnostic and Testing Methods
8. Visual Inspection
9. Earth Continuity Test
10. Insulation Resistance Test

(6.GV.02) Good Manufacturing Concept & Practices – I

- TQM (Total Quality Management) & Kaizen
- Inventory Management & Logistics in brief
- Quality assurance
- Checklist
- SWOT analysis
- Lean Manufacturing
- Muda, Mura & Muri – Toyota Production System (TPS)
- Spatial considerations & other related concepts

Electronics Devices & Circuit-I

Unit I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism. Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions. Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode. Introduction to Thyristors, PNPN diode, SCR, LASCR, DIAC, TRIAC

Electronics System Packaging and Manufacturing

Evolution and Classification of Printed Circuit Boards, Challenges in Modern PCB Design and Manufacture, PCB fabrication methodologies (SSB, DSB and multilayer board), PCB design considerations/ design rules for analog, digital and power applications, Electromagnetic

interference in electronic systems and its impact. Analysis of electronic circuit from noise emission point of view (both conducted and radiated emission) cross talk and reflection behavior of the circuit in time domain, Thermal management of electronic devices and systems.

Semiconductor Packages: Single chip packages or modules. (SCM) Commonly used packages and advanced packages; Materials in packages, Current trends in Packaging, Multichip modules (MCM)-types; System-in package (SIP); Packaging roadmaps; Hybrid circuits. Pipe and FIFOs, Shared memory, Sockets

Electronic Devices and Circuits Lab

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
7. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
8. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.

Fault Analysis & Repairs - Lab

1. Categorization of faults
   - Hardware/Software, User Induced, Component Failures
   - L0 to L4 repairs
2. Testing electrical/electronic components in the product
3. Troubleshoot and repair of the faults identified in the product
   - Microphone
   - Musical Instruments (Loudspeakers)
   - Recorder (CD/ DVD Player)
4. Preventive Maintenance Services
5. Basic Occupational Safety and Precautions
6. Microphones and Loudspeakers

Level 6 (Semester IV)

Good Manufacturing Concepts & Practices – II

- Work Study Concepts
  - Method study
  - Work measurement
  - Sequencing of Operations and timing the flow steps
  - Advantages of work study

- Team Working
  - Forming
  - Storming
  - Norming
  - Performing
  - Adjourning

Manufacturing & Quality Norms

1. Manufacturing & Quality Norms- keep it differently according to all applications
   - Manpower Deployment and Operations as per Work Instructions and criticality of the process Understanding how to form each operation and practical training of operation
   - Understanding accept and reject criterion of a particular operation. Practical training of testing/checking each operation
   - Quality Norms of accept and practical training of electronic equipment's/Devices
   - Acceptance/ Rejection training of various defects

2. Manufacturing & Quality Norms – II
   - Process in packing line-Packing line Operations sequence flow and its importance
   - Quality Systems - Accept, Reject criterion of various tests at OQA
   - Training of Assembly of electronic components - Assemble, Check, test electronic components
   - Various Labels and their Importance - Understanding Labels, Scanning and its importance
   - Packing of components/devices - Various Stages of packing
   - Acceptance, Reject and sampling following QA norms - AQL level, Sampling techniques, as per QA sampling accept, reject numbers

Good Manufacturing Concepts & Practices – III

1. Good Manufacturing Concepts & Practices - II
   - Brief Introduction
   - Total Quality Management
     - ISO Standards
   - Kaizen
   - Toyota Production System

- Lean Manufacturing
  - Combination of Inventory
  - Supply Chain
- Quality and Inspection
  - 3 Sigma and 6 Sigma Orientation

Electronic Devices and Circuits –II

UNIT I MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT II BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT III Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator

Electronic Devices and Circuits –II Lab

1. Characteristic of BJT: BJT in CE configuration- Graphical measurement of hparameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
2. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
3. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
4. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
5. Oscillators: Sinusoidal Oscillators a. Wein's bridge oscillator b. phase shift oscillator.

Manufacturing Practices

1. Work study concepts
2. Team work concepts

Level 7 (Semester V)

Valuations & Storage

1. Valuation
    - Specific Item cost
    - Weighted average cost
2. Storage
    - Stacking Norms
    - Bin Cards
    - Stores Layout
    - Categorization of Materials
        - Hazardous/Non-Hazardous
        - Imported/Local
        - Assembly/ Parts
        - Consumables
        - Class A/B/C
        - Good/defective

Shelf Life, Ware House Operations Management & Material Transactions

1. Shelf Life Management
    - FIFO
    - FILO
    - LIFO
    - LILO

2. Material Transactions
    - Inward
    - Outward
    - Suspense
    - RMA (Return Material Authorization)
    - Insurance

Industrial Electronic Product Design

Development Process, Product Planning & Conceptualization, Product Architecture and Industrial Design, Product Manufacturing & Prototyping, Economic Analysis & Managing Projects. Introduction to 3-D printing and Rapid Prototyping

Pre-Production Activities

Pre-Production activities
- Layout
- Time Study & Motion Study
- Two Hand Insertion
- Non-value adding activities
- Positioning of Bins
- Line Balancing

Pre-Production Activities Lab

- Pre-Production activities
  - Two Hand Insertion
  - Positioning of Bins

- House Keeping
- 5S

Valuations & Storage Lab

- Categorization of Raw Material & Consumables
  - Hazardous/Non-Hazardous
  - Imported/Local
  - Assembly/Parts
  - Class A/B/C
  - Good/defective

- Material Transactions
  - Inward
  - Outward
  - Suspense

Level 7 (Semester II)

Accounting & Management/ Entrepreneurship

1. Introduction
Meaning and Nature of Management, Management Approaches, Processes, Managerial Skills, Tasks and Responsibilities of a Professional Manager.

2. Organizational Structure and Process
Organizational Culture and Climate, Managerial Ethos, Organization Structure & Design, and Managerial Communication.

3. Planning and Controlling
Planning Types and Process, Management by Objectives, Decision-Making Types and Models, Problem Solving Techniques, Controlling: Process and Techniques.

4. Performance Evaluation Techniques:
Introduction to Budgeting and Budgetary Control; Performance Budgeting; Classification of Budget; Standard Costing and Variance Analysis; Balanced Scorecard; Responsibility Accounting.

5. Decision Making Techniques:
Cost Volume Profit Analysis; Management Accounting for Decision Making and Control; EVA and Performance Measurement; Introduction to Activity Base Costing, Targeting Costing, Life Cycle Costing; Uniform Costing.

Or

Course Contents:

1. Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

2. Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

3. Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

4. Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD;

State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies-At least 4 (four) in whole course

Trouble Shooting & Maintenance of Electronics Equipment's-II

1. TV System

- Working principle with block diagram of TV transmitter and receiver, Brief description with circuit diagram: TV Tuner, Video IF stage, Sound stage, Picture tube & its associated circuit, Synchronizing circuits, Horizontal & vertical deflection circuits, Remote control of a TV receiver, Idea of bandwidth, blanking and synchronization pulses, modulation scheme, colour transmission.
- Cable type TV system, Head end processor, Trunk & cable distribution system with block diagram, Scrambling.
- Introduction to LCD and LED TV systems, Introduction to high definition systems. Steps for Fault finding & Analysis.

2. Modern Appliances

- Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis.

Project Work

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS
For
B. Voc.
Medical Imaging Technology(MI)
Branch Code:112

Based on
AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

1. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of Medical Imaging Technology so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired.

A. Understanding of

(a) The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Biology) so that he/she is able to understand the different vocational subjects.
(b) The basic concepts in engineering drawing.
(c) The concepts, principles of working of basic electronic devices and circuits.
(d) The knowledge of procedures of medical imaging.
(e) The procedure of operation and upkeep of Medical Imaging equipments.
(f) The concepts and principles used in safety while using equipments.

B. Adequate Professional Skills and Competencies in

(a) Testing different electronic components.
(b) Testing the performance of electronic circuits.
(c) Locating the fault at component level and at the stage level.

C. A Healthy and Professional Attitude so that He/She has

(a) An analytical approach while working on a job.
(b) An open mind while locating/rectifying faults.
(c) Respect for working with his/her own hands.
(d) Respect for honesty, punctuality and truthfulness.

Curriculum

Semester-I(NSQF Level-5)											
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV511	Electronic Measurement and Instrumentation -I	30	10	5	5	20	30		50	2
2	BMIV512	Basic Anatomy (Cross Sectional Anatomy-II)	30	10	5	5	20	30		50	2
3	BMIV513	Tools, Equipment & Safety Measures –I	30	10	5	5	20	30		50	2
4	BMIV514	Soldering & De-Soldering of Components –I	30	10	5	5	20	30		50	2
5	BMIP511	Identification of Components, Tools, Equipment and its working –Lab	30				20		30	50	2
6	BMIP512	Basic diagnostics (Lab)	30				20		30	50	2
7	BMIP513	Language Lab	30				20		30	**50**	**2**
8	On-Job-Training (OJT)/Qualification Packs		400hr/8 weeks							150	12
	Total		580							500	24

Semester-II(NSQF Level-5)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV521	Electronic Measurement and Instrumentation –II	30	10	5	5	20	30		50	2
2	BMIV522	Basic Imaging	30	10	5	5	20	30		50	2
3	BMIV523	Tools, Equipment & Safety Measures –II	30	10	5	5	20	30		50	2
4	BMIV524	Soldering & De-Soldering of Components & Emergency actions II	30	10	5	5	20	30		50	2
5	BMIP521	Soldering & De-Soldering of Components-Lab	30				20		30	50	2
6	BMIP522	Basic Imaging Practical Lab	30				20		30	50	2
7	BMIP523	IT Tool Lab	30				20		30	50	2
8	**On-Job-Training (OJT)/Qualification Packs** (To continue with the same QP as opted in Level 5 First semester)		400hr/8 weeks							150	12
	Total		580							500	24

Semester-III(NSQF Level-6)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV631	Fault analysis & Repairs	30	10	5	5	20	30		50	2
2	BMIV632	Cross Sectional Anatomy-II	30	10	5	5	20	30		50	2
3	BMIV633	Electronics Devices Circuit –I	30	10	5	5	20	30		50	2
4	BMIV634	Radiation and administrative Issues	30	10	5	5	20	30		50	2
5	BMIP631	Electronics Devices Circuits Lab	30				20		30	50	2
6	BMIP632	Fault analysis & Repairs - Lab	30				20		30	50	2
7	BMIP633		30				20		30	50	2
7	**On-Job-Training (OJT)/Qualification Packs** Assistant Duty Manager - Patient Relation Services (HSS/Q6103)		400hr/8 weeks							150	12
	Total		580							500	24

Semester-IV(NSQF Level-6)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV641	CT and Ultrasound	60	20	10	10	40	60		100	4
2	BMIV642	Manufacturing & Quality Norms	30	10	5	5	20	30		50	2
3	BMIV643	Electronics Devices Circuit –II	30	10	5	5	20	30		50	2
4	BMIP641	Electronics Devices Circuit –II Lab	30				20		30	50	2
5	BMIP642	Manufacturing Practices	30				20		30	50	2
6	BMIP643		30				20		30	50	2
7	**On-Job-Training (OJT)/Qualification Packs** (To continue with the same QP as opted in Level 6 First semester)		400hr/8 weeks							150	12

	Total	580							500	24

Semester-V(NSQF Level-7)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV751	MRI, Image Processing and Recording	60	20	10	10	40	60		100	4
2	BMIV752	Advanced Imaging	60	20	10	10	40	60		100	4
3	BMIP751	MRI, Image Processing and Recording	30				20		30	50	2
4	BMIP752	Advanced Imaging	30				20		30	50	2
5	**On-Job-Training (OJT)/Qualification Packs** (Duty Manager - Patient Relation Services (HSS/Q6104))		400hr/8 weeks							200	12
	Total		580							500	24

Semester-VI(NSQF Level-7)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV761	Admin, Medico Legal and interventional Procedures	60	20	10	10	40	60		100	4
2	BMIV762	Project	60	20	10	10	40	60		100	4
3	BMIP761	Admin, Medico Legal and Interventional Procedures	60				40		60	100	4
4	**On-Job-Training (OJT)/Qualification Packs** (The practical and theory need to be performed in a hospital/radiological centre) To continue with the same QP as opted in Level 7 First semester		400hr/8 weeks							200	12
	Total		580							500	24

Detailed Curriculum(Semester I)

Electronic Measurements and Instrumentation-II

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.
PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter
Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

Basic Anatomy (Cross Sectional Anatomy-II)

1. Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax and mid thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels, Lungs, heart and great vessels, Esophagus
3. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels
4. Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems
5. Neuro Anatomy- Scan planes
6. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
7. Spine- Vertebra and disc, Spinal cord and meninges
8. Neck- Arterial/venous systems, Muscles, Glands and pharynx

Tools, Equipment and Safety Measures-I

1. **Cables & Connectors**
   - Non-Metallic Sheathed Cable
   - Un grounded & Grounded Power Supply Cable
   - Metallic Sheathed Cable
   - Multi-Conductor Cable
   - Coaxial Cable
   - Unshielded Twisted Pair Cable
   - Shielded twisted pair cable
   - Ribbon Cable
   - Armoured & Unarmoured Cable
   - Twin-Lead Cable
   - Twin axial Cable
   - Optical fiber cable
   - Connectors
2. **ESD Clothing**
   - What to wear, how to wear

Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

Identification of Components, Tools, Equipment's & working – Lab

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.

Basic Diagnostics (Lab)

1. **X–Ray Imaging**
   - X–Ray Tubes.
   - Stationary & Rotation Anode.
   - X–ray Consolestation (Demo of KV, MA and exposure time settings).
   - Procedures to reduce Scattered Radiation.
   - Focus Principle.
   - Grids.
   - Screen.
   - Image intensifiers.
   - Use of contrast materials.

2. **Dark Room Technique**
   - Images to ring devices.
   - Film cassette construction.
   - Duplicating a films
   - Spectrum.
   - Films types - Specialized use.
   - Operation, storage.
   - Photo chemistry.
   - Development.
   - Fixing.
   - Radiation protection, counters.
   - Assessment.

3. **Radiological Positioning**
   - Patient transfer technique.
   - Turning the patient.
   - Restraint techniques - Trauma, Pediatric, Geriatric, physically handicapped, disturbed patients, an aesthetized patient, moving chair & stretcher patients.
   - Tubes & catheters, Nasogastric, chest, Urinary, intravenous, oxygen & other (Castsurgical & cardiac) Alcoholic, bed pans & urinals.
   - Assessment.

(Semester II)

Electronic Measurements and Instrumentation – II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications

Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

Basic Imaging

1. **The photographic Process:** Introduction, visible light, images produced by radiation, light sensitive photographic materials.
2. **Image Characteristic:** Real and mental images, reflected, transmitted and emitted light images Photographic emulsions. The photographic latent image. Positive process
3. **Film materials in X-ray:** History, structure of an x- ray film, single and double emulsion films, types of films, cross over effect.
4. **Spectral sensitivity** of film material, graininess of film material, speed and contrast of photographic materials.
5. **Sensitometry:** Photographic density, characteristic curves, features of the characteristic curve.
6. **Intensifying screens and cassettes.** Cassette design, care of cassettes, types of cassettes, and mounting of intensifying screens, loading and unloading of cassettes, Care of intensifying screens, tests to check screen film contact and lightleakage.
7. **The fluorescent materials,** types of intensifying screens, intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed, size of the crystals, reciprocity failure, and quantum mottle.
8. **Film processing:** Development. The nature of development-manual or automatic. The PH scale, constitution of developing solutions both in manual and automatic processing and properties of developing chemicals, development time, factors in the use of a developer, developer activity.
9. **Dark Room:** Layout and planning. Dark room construction - Nature of floor, walls, ceiling and radiation protection, Dark room equipment and its layout. Location of pass through boxes or cassette hatches.
10. **Radiographic Image:** Components in image quality-density, contrast and detail.
11. **Photo Fluorography:** Cine cameras, cine fluorography, cine film, serial cameras, processing of cine films, flurographic films.

Tools, Equipment & Safety Measures-II

1. Tools & Equipment
   - Types of tools & equipment required and deployed in manufacturing, installing & servicing
   - Identification and termination process
   - General maintenance of tools/equipment and recalibration of Test equipment
   - General safety and common-sense safety
2. PPE
   - Usage & benefits of PPE
   - Types & usage of various PPE
   - Maintenance of PPE
3. Clean Room Environment
   - Do's and Don't
   - Shop Floor Discipline

Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components

- Identification of 2, 3, 4 terminal SMD components
- Soldering the SMD components on the PCB
- Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
- Identify various connections and the setup required for SMD soldering station
- De solder the SMD components from the given PCB
- Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
- Make a panel board using different types of switches for a given application
- Identification of crimping tools for various IC packages
- Reliable Soldering Practices

2. Emergency actions

- Minimum Requirements
- Reporting Emergencies
- Emergency exits
- Primary and secondary evacuation routes
- Locations of fire extinguishers
- Fire alarm pull stations' location
- Assembly points
- Medical Services

Soldering & De-soldering components – Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

Basic Imaging Practical's Lab

1. Test to check the x-ray films and screen contact in the cassette
2. Test to check light leakage in the cassette.
3. To check the effect of safe light on exposed as well as unexposed x-ray film

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

(Semester III)

Fault Analysis & Repairs

1. Classification of fault
2. Identification of fault
3. Rectification of fault
4. Repairing/Replacing Module
5. Analysis for the different types of equipment's
   - Smartphones
   - Air Conditioning
   - Security systems
   - Electronically controlled doors
6. Fault analysis based on hardware and software component
7. Diagnostic and Testing Methods
8. Visual Inspection
9. Earth Continuity Test
10. Insulation Resistance Test

Cross Sectional Anatomy-II

1. Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels.
3. Divisions of the mid-thorax, heart and great vessels- Lungs, heart and great vessels, Esophagus
4. CT/MRI Images of the Thorax - Normal and pathologic
5. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels
6. CT/MR Images of Abdomen - Normal and pathologic
7. Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems
8. Reproductive Organs
9. CT/MR Images of the Male/Female Pelvis- Normal and pathologic
10. Neuro Anatomy- Scan planes
11. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
12. Spine- Vertebra and disc, Spinal cord and meninges
13. Neck- Arterial/venous systems, Muscles, Glands and pharynx

Electronics Devices Circuit-I

Unit I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism. Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions. Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

Radiation & Administrative Issues

1. **Quality Assurance:** General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually – machine calibration. Basic concepts of quality assurance, Radiation proof test; Resolution test; Phantom measurements - CT, US and MRI, Sensitometry, State and local regulations governing radiation protection practice.
2. **Maintenance and care of equipment:** Safe operation of equipment, Routine cleaning of equipment and instruments, Cassette, screen maintenance, Maintenance of automatic processor and manual processing units, Routine maintenance of equipment.
3. **Radiation protection:** Somatic and genetic radiation effects, Basis for occupational exposure limits, Ionizing radiation from natural and man-made source and their approximate dose equivalent contribution. Legal and ethical radiation protection responsibilities of radiation workers.
4. **Units detection and measurement:** Units of radiation for exposure, absorbed dose, dose equivalent, and radio- activity, Quality factor to determine the doseequivalent.
5. **Radiation detection devices:** Ion-Chambers, Proportional counter, Thermo-luminescent dosimeters (TLD), Appropriate application and limitation of each radiation detection device.
6. **Personal monitoring and occupational exposures:** Monitoring devices, Body badges and ring badges. Thermo-luminescent dosimeters. Pocket ionization chambers. Applications, advantages and limitations of each device, Values for dose equivalent limits for occupational radiation exposures. Structures critical for potential life effect for whole body irradiation. Age proportion formula for the determination of a maximum accumulated dose equivalent.
7. **Patient Protection:**
   Relationship of beam limiting devices with radiation protection of patients, Added and inherent filtration, Purpose and importance of patient shielding, Patient shielding devices and radiographic procedures shielding to the radiographic procedures, Protection of women at child- bearing age, Methods to avoid repeat radiographs, Importance of clear, concise, instruction (effective communication skills) as a method of radiation protection, Effects of immobilization techniques to eliminate voluntary motions
8. **AERB specifications:** Radiation safety (lead glass equivalence, lead lined doors) - room size - type approval – registrations & licenses - selection of exposure parameter for

various protocols – diagnostic reference levels.

Electronic Devices and Circuits Lab

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.

Fault Analysis & Repairs – Lab

1. Categorization of faults
   - Hardware/Software, User Induced, Component Failures
   - L0 to L4 repairs
2. Testing electrical/electronic components in the product
3. Troubleshoot and repair of the faults identified in the product
4. Preventive Maintenance Services

(Semester IV)

CT and Ultrasound

1. Computed Tomography (CT)

- **Basic Computed Tomography**: Basic principles of CT, generations of CT, CT instrumentation, image formation in CT, CT image reconstruction, Hounsfield unit, CT image quality, CT image display
- **X-ray tube:** Construction working and limitations, generations, methods of cooling the anode, anode rating chart, speed of anode rotation, angle of anode inclination, Focus, anode heel effect, Effect of variation of anode voltage and filament temperature, inherent filter and added filter, bow tie filter, effect on quality of the spectrum.
- **Collimator designs**: Pencil beam, Fan beam, Cone beam CT, Z-axis collimation, detector design – construction and working - Gas filled detectors – solid state detectors – flat panel detectors.
- **Principles of tomography**: advantages and limitations – generations – spiral CT – slip ring technology - Multislice CT – dual source CT - pitch – rotationtime.
- **Basic principles of Image Reconstruction:** Back projection, analytical an iterative methods – MPR – MIP – volume rendering – surface shaded display (SSD) – bone reconstruction.
- **CT artefacts:** motion artefacts, streak artefacts, ring artefacts, partial volume artefacts etc. causes and remedy.
- **Dose and Dosimetry:** CT Dose Index (CTDI, etc.), Multiple Scan Average Dose (MSAD), Dose Length Product (DLP), Dose Profile, Effective Dose, Phantom Measurement Methods, Dose for Different Application Protocols, Technique Optimization
- **Advanced Computed Tomography:** Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose, patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols – CT angiography – (Aortogram, selective angiogram head, neck and peripheral) image documentation and Filing, maintenance of equipment and accessories.
- **Technical Assessment and Equipment Purchase Recommendations**

2. Ultrasonography

- **Basic Acoustics, Ultrasound terminologies:** acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity.
- **Interaction of US with matter:** reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, US machine controls, US focusing.
- **Production of ultrasound:** Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam.
- **Ultrasound display modes:** A, B, M

- **Real-time ultrasound:** Line density and frame rate, Real-time ultrasound transducers: mechanical and electronic arrays, ultrasound artifacts, ultrasound recording devices, and Distance, area & volume measurements.
- **Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety.**
- **Doppler Ultrasound:** Doppler Theory, Doppler-Frequency Shift, Reflector Velocity Dependence, Doppler Angle Dependence, Spectral Analysis, Continuous Wave (CW) Doppler, Pulsed Doppler, Pulse Transmission and Range Gating, Aliasing, Duplex Scanning, Color Flow Imaging, Power Doppler, Patient preparation for Doppler, Doppler artifacts, vascular sonography.

Manufacturing & Quality Norms

1. Manufacturing & Quality Norms- keep it differently according to all applications
   - Manpower Deployment and Operations as per Work Instructions and criticality of the process Understanding how to form each operation and practical training of operation
   - Understanding accept and reject criterion of a particular operation. Practical training of testing/checking each operation
   - Quality Norms of accept and practical training of electronic equipment's/Devices Acceptance/Rejection training of various defects
2. Manufacturing & Quality Norms – II
   - Process in packing line-packing line Operations sequence flow and its importance
   - Quality Systems - Accept, Reject criterion of various tests at OQA
   - Training of Assembly of electronic components - Assemble, Check, test electronic components
   - Various Labels and their Importance - Understanding Labels, Scanning and its importance
   - Packing of components/devices - Various Stages of packing
   - Acceptance, Reject and sampling following QA norms - AQL level, Sampling techniques, as per QA sampling accept, reject numbers

Electronics Devices Circuit-II

1. Good Manufacturing Concepts & Practices - II
   - Brief Introduction
   - Total Quality Management
   - ISO Standards
2. Kaizen
3. Toyota Production System
4. Lean Manufacturing
   - Combination of Inventory
   - Supply Chain
5. Quality and Inspection
   - 3 Sigma and 6 Sigma Orientation

Electronic Devices and Circuits –II Lab

1. Characteristic of BJT: BJT in CE configuration- Graphical measurement of parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
2. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
3. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
4. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
5. Oscillators: Sinusoidal oscillators. Wein's bridge oscillator b. phase shift oscillator.

Manufacturing Practices

1. Work study concepts
2. Team work concepts

(Semester V)

MRI, Image Processing and Recording

1. Basic concepts of Magnetic resonance imaging (MRI): Atomic structure, Hydrogen as imaging medium, magnetism, precession, resonance, Electromagnetic radiation, NMR - basic concepts of MRI, Faraday's cage.
2. Basic MR Image formation: RF Excitation, Relaxation (T1 and T2), Computation and display, Free induction decay, RF wave form designs.
3. Introduction to MR coils: Volume coils, Gradient coils, Slice selection, phase encoding, frequency encoding
4. Artifacts: Cause of artifacts, Image quality, image contrast, signal to noise ratio, resolution, artefacts, MR contrast agents, Advanced MR techniques, flow effects, MR angiography echo planner imaging, magnetization transfer, fat suppression, MR spectroscopy, functional imaging, Magnetic resonance hazards and safety, Recent development.
5. MRI Scanners: Methods of MRI imaging methods; Head and Neck ,Thorax, Abdomen, Musculoskeletal System imaging; Clinical indications and contraindications; types of common sequences effects of sequence on imaging; Protocols for various studies, slice section, patient preparation; positioning of the patient; patient care-calibration - paramagnetic agents and dose, additional techniques and recent advances in MRI; image acquisition-modification of procedures in an unconscious or un co-operative patient; plain studies; contrast studies; special procedures; reconstructions; 3D images; MRS blood flow imaging, diffusion/perfusion scans; strength and limitations of MRI; role ofradiographer.
6. MR safety: instrumentation and biological effects

Advanced Imaging

1. Computed Tomography its principle, various generations and advancements.
2. Ultrasonography, Color Doppler- its principle, advancements and applications.
3. Digital Radiography and Digital subtraction angiography equipment- principle, advancements and applications.
4. Fusion Imaging including PET-CT, PET- MRI.
5. Digital Mammography, DEXA equipment- principle, advancements and applications.
6. Tele radiology HIS, RIS and PACS
7. Image processing in digital radiography systems: Post processing techniques in console using CR, DR and flat panel fluoroscopy systems
8. Basic angiography and DSA

MRI, Image Processing and Recording

1. MRI Images of the Thorax - Normal and pathologic
2. MR Images of Abdomen - Normal and pathologic
3. MR Images of the Male/Female Pelvis- Normal and pathologic
4. Neuro Anatomy- Scan planes brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
5. Spine- Vertebra and disc, Spinal cord and meninges

Advanced Imaging

1. Central Nervous System: Myelography, Cerebral studies, Ventriculography
2. Arthrography: Shoulder, Hip, Knee, Elbow
3. Angiography: Carotid Angiography (4 Vessel angiography), Thoracic and Arch Aortography, Selective studies: Renal, SMA, Coeliac axis, Vertebral angiography, Femoral arteriography, Angiocardiography
4. Venography: Peripheral venography, Cerebral venography, Inferior and superior venocavography, Relevant visceral phlebography
5. Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophyiology
6. Gynaecology: Hysterosalpingography
7. Biliary system: Plain film radiography, Intravenous cholangiography, percutaneous cholangiography, Endoscopic retrograde cholangio-pancreatography. (ERCP), Operative cholangiography, Post-Operative cholangiography (T-tube Cholangiography)
8. Gastrointestinal tract: Barium meal, Barium swallow, Small bowel enema, Barium enema.
9. Renal tract: Intravenous urography, retrograde pyelography, micturating cystourethrography.
10. Other: Sialography

(Semester VI)

Admin, Medico Legal and Interventional Procedures

1. Principals of Management: Introduction to management, Strategic Management, Foundations of Planning, Planning Tools and Techniques, Decision Making, conflict and stress management, Managing Change and Innovation, Understanding Groups and Teams, Leadership, Time Management, Cost and efficiency.
2. Medical law and ethics: Medical ethics; Definition, Goal, Scope; Introduction to Code of conduct; Basic principles of medical ethics – Confidentiality; Malpractice and negligence; Autonomy and informed consent - Right of patients; Care of the terminally ill-Euthanasia ; Organ transplantation; Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects; Professional Indemnity insurance policy; Development of standardized protocol to avoid near miss or sentinel events; Obtaining an informed consent.
3. Quality and patient safety: Quality assurance; Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines; AERB specifications, radiation safety (lead glass equivalence, lead lined doors), room size, type approval, registrations & licenses, selection of exposure parameter for various protocols, diagnostic reference levels.
4. Basics of emergency care and life support skills: Basic life support (BLS), sudden Cardiac Arrest (SCA), cardiopulmonary resuscitation (CPR), Automated External Defibrillator (AED).

Project

Project work may include case study related to Newer Imaging Technology.

Admin, Medico Legal and Interventional Procedures

1. Quality assurance and Radiation safety survey in diagnostic X-ray installations.
2. Community orientation and clinical visit**:** Visit will include visit to the entire chain of healthcare delivery system - sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics.
3. Governance at village level including interaction and group discussion with village panchayat and front line health workers.
4. Clinical visit to their respective professional department within the hospital.

Syllabus 2019-20

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. SECOND YEAR

(CIVIL ENGINEERING)

(Effective from session 2019-20)

THIRD SEMESTER CIVIL ENGINEERING SESSION 2019-20

S.No	Subject Codes	Subject	Periods L	T	P	Evaluation Scheme CT	TA	Total	PS	End Semester TE	PE	Total	Credit
1	KOE031-38/KAS303	Engineering Science Course/Maths III	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE301	Technical Communication/ Universal Human Values	2 3	1 0	0 0	30	20	50		100		150	3
3	KCE301	Engg. Mechanics	3	1	0	30	20	50		100		150	4
4	KCE302	Surveying and Geomatics	3	1	0	30	20	50		100		150	4
5	KCE303	Fluid Mechanics	3	0	0	30	20	50		100		150	3
6	KCE351	Building Planning & Drawing Lab	0	0	2				25		25	50	1
7	KCE352	Surveying and Geomatics Lab	0	0	2				25		25	50	1
8	KCE353	Fluid Mechanics Lab	0	0	2				25		25	50	1
9	KCE354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/ Python Programming	2	0	2	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										950	22
*The Mini Project or Internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.													

SEMESTER - IV

S.No	Subject Codes	Subject	Periods L	T	P	Evaluation Scheme CT	TA	Total	PS	End Semester TE	PE	Total	Credit
1	KAS403/ KOE041-48	Maths III/ Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KCE401	Materials, Testing & Construction Practices	3	0	0	30	20	50		100		150	3
4	KCE402	Introduction to Solid Mechanics	3	1	0	30	20	50		100		150	4
5	KCE403	Hydraulic Engineering and Machines	3	1	0	30	20	50		100		150	4
6	KCE451	Material Testing Lab	0	0	2				25		25	50	1
7	KCE452	Solid Mechanics Lab	0	0	2				25		25	50	1
8	KCE453	Hydraulics & Hydraulic Machine Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										900	21

ENGINEERING MECHANICS (L-T-P 3-1-0) Credit – 4

Course Outcomes: At the end of this course the student will be able to-

1. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
3. Apply basic knowledge of mathematics and physics to solve real-world problems.
4. Understand basic dynamics concepts – force, momentum, work and energy;
5. Understand and be able to apply Newton's laws of motion;

UNIT - I Introduction to Engineering Mechanics*:* Force Systems, Basic concepts, Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant-Moment of Forces and its Applications; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems.

Friction*:* Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; [8 Hours]

UNIT- II Centroid and Centre of Gravity*,* Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia-Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. [8 Hours]

UNIT - III Basic Structural Analysis*,* Equilibrium in three dimensions; Analysis of simple trusses by method of sections & method of joints, Zero force members, Simple beams and support reactions. [8 Hours]

UNIT - IV Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). [8 Hours]

UNIT - V Introduction to Kinetics of Rigid Bodies*,* Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, Applications of energy method for equilibrium, Stability of equilibrium. [8 Hours]

Books and References

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press

5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,

6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education

7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics

8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications

9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

11. Strength of Materials by Timoshenko and Yσungs, East West Press.

12. Textbook of Applied Mechanics-Dynamics and Statics by Prasad I.B, Khanna Publications.

SURVEYING & GEOMATICS (L-T-P 3-1-0) Credit – 4

Course Outcomes: At the end of this course the student will be able to-

1. Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
2. Calculate, design and layout horizontal and vertical curves.
3. Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.
4. Relate and apply principles of photogrammetry for surveying.
5. Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.

UNIT - I

Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and it methods, Meridians and Bearings, Methods of leveling, Booking and reducing levels, Reciprocal leveling, distance of visible horizon, Profile leveling and cross sectioning, Errors in leveling; Introduction to methods of plane table surveying; *Contouring:* Characteristics, methods, uses, computation of areas and volumes. *Theodolite survey:* Instruments, Measurement of horizontal and vertical angle; Methods of horizontal and vertical control, *Triangulation:* Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, *Trigonometric leveling*: Accessible and inaccessible objects. [8 Hours]

UNIT - II

Curves: Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves. [8 Hours]

UNIT - III

Modern Field Survey Systems: Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems- Segments, working principle, errors and biases. *Geographic Information System:* Concepts and data types, data models, data acquisition. GIS applications in civil engineering. [8 Hours]

UNIT - IV

Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations. Introduction to digital photogrammetry. [8 Hours]

UNIT - V

Remote Sensing: Concepts and physical basis of Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics. Remote sensing systems, spectral signatures and characteristics spectral reflectance curves. Salient features of some of Remote Sensing satellites missions. *Digital image processing:* Introduction, image rectification and restoration, image

enhancement, image transformation, image classification. Applications of remote sensing to civil engineering. [8 Hours]

Books and References:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010

4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.

6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.

7. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication

8. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science

9. Ghosh SK: Digital Image Processing, Alpha Science

10. Lillesand T M et al: Remote Sensing & Image Interpretation, John Wiley & Sons

11. Bhatta B: Remote Sensing and GIS, Oxford University Press, 2008

FLUID MECHANICS (L-T-P 3-0-0) Credit – 3

Course Outcomes: At the end of this course the student will be able to-

1. Understand the broad principles of fluid statics, kinematics and dynamics
2. Understand definitions of the basic terms used in fluid mechanics
3. Understand classifications of fluid flow
4. Apply the continuity, momentum and energy principles
5. Apply dimensional analysis

UNIT I Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density height relationship, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. [8 Hours]

UNIT II Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, path lines, streak lines, stream tube, continuity equation for 1-D, 2-D and 3-D flows, circulation, stream function and velocity potential function. [8 Hours]

UNIT III Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks. [8 Hours]

UNIT IV Equation of motion for laminar flow through pipes, Stokes' law, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, displacement, momentum and energy thickness. Application of momentum equation. Laminar boundary layer, turbulent boundary layer, laminar sub-layer, separation and its control. Vortex Flow: Free & Forced. [8 Hours]

UNIT V Drag and lift, drag on a sphere, aerofoil, Magnus effect, Similarity Laws; geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance. Introduction to Computational Fluid Dynamics (CFD). [8 Hours]

Books and References

1. Hibbler, "Fluid Mechanics in SI Units" 1/e Pearson Education, Noida.

2. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,

3. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.

4. Katz, "Introductory Fluid Mechanics" Cambridge University Press

5. Pnueli & Gutfinger, "Fluid Mechanics" Cambridge University Press

6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.

7. Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida

8. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor & Francis Group.

9. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor & Francis Group.

10. AK Jain “Fluid Mechanics” Khanna Publication.

11. White,F.M. “Fluid Mechanics” TMH, New Delhi.

12. Munsen et al , “Fundamental of Fluid Mechanics” Wiley Newyork Ltd

13. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd

14. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student.

15. RK Bansal “Fluid Mechanics and Hydraulic Machines” Laxmi Publication

16. Jagdish Lal “Fluid Mechanics”

17. N Narayan Pillai “ Principles of Fluid Mechanics & Fluid Machines” Universities Press.

18. Esposito, Fluid Power & Applications” 7/e Pearson Education, Noida.

19. DR Malhotra & Malhotra, “Fluid Mechanics Hydraulics & Hydraulic Machines” Satya Prakashan, New Delhi.

BUILDING PLANNING & DRAWING LAB (L-T-P 0-0-2) Credit – 1

Drawing and drafting of following with CAD/BIM software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting

SURVEYING & GEOMATICS LAB (L-T-P 0-0-2) Credit – 1

1. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
2. To find out reduced levels of given points using Auto/dumpy level.
3. To study parts of a Vernier and electronic theodolite and measurement of horizontal and vertical angle.
4. To measure horizontal angle between two objects by repetition/reiteration method.
5. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
6. To set out a simple circular curve by Rankine's method.
7. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles, coordinates and area of a land parcel.
8. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
9. Visual Interpretation of standard FCC (False colour composite).
10. Digitization of physical features on a map/image using GIS software.
11. Coordinates measurement using GPS.

FLUID MECHANICS LAB (L-T-P 0-0-2) Credit – 1

Note: Students will perform minimum 10 experiments from the following:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. Verification of Bernoulli's Theorem
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement, sudden contraction and losses in bend.
13. Flow Visualization -Ideal Flow
14. To make studies in Wind Tunnel (Aerofoil and circular cylinder).

Materials, Testing & Construction Practices (L-T-P 3-0-0) Credit – 3

Course Outcomes: At the end of this course the student will be able to-

1. Identify various building materials and to understand their basic properties.

2. Understand the use of non-conventional civil engineering materials.

3. Study suitable type of flooring and roofing in the construction process.

4. Characterize the concept of plastering, pointing and various other building services.

5. Exemplify the various fire protection, sound and thermal insulation techniques, maintenance and repair of buildings.

UNIT I Scope of Study of building Materials: building materials and their performance, economics of the building materials.

Stones: Requirement of good building stone, characteristics of building stone sand their testing. Common building stones.

Bricks: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. Different types of bricks.

Gypsum: properties of gypsum plaster, building products made of gypsum and their uses.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement.

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products.

Asphalt: Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

[8 Hours]

UNIT II Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. Paints, varnishes and distempers: Common constituents, types and desirable properties, Cement paints. Ferrous metals: Desirable characteristics of reinforcing steel. Principles of cold working. Strength ,Telemechanical, physical Properties and chemical composition. Brief discussion on properties and uses of Aluminum and lead. Glass: Ingredients, properties types and use in construction. Insulating Materials: Thermal and sound insulating material, desirable properties and types. [8 Hours]

UNIT III Building Construction: Components of building area considerations, Construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, Vertical circulation: stair cases and their types and planning. Different types of floors, and flooring materials .Bricks and stone masonry construction. Cavity wall & hollow block construction.

[8 Hours]

UNIT IV Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning. [8 Hours]

UNIT V Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance. [8 Hours]

Books and References

1. SK Duggal, "Building Materials" New Age International

2. Purushothama Raj, "Building Construction Materials & Techniques" Pearson Edu.

3. PC Varghese, "Building Materials" PHI

4. Rangwala, "Building Materials" Charotar Publishing House.

5. Sushil Kumar, "Building Construction" Standard Publisher.

6. Domone, "Construction Materials" 4/e, CRC Press Taylor & Francis Group.

7. Adams, "Adams' Building Construction Adams" CRC Press Taylor & Francis Group.

8. BC Punmia, "Building Construction" Laxmi Publication.

9. Jha & Sinha, "Building Construction" Khanna Publishers

10. Sahu, "Building Materials and Construction" Mc Grew Hill Education

11. Deodhar, "Civil Engineering Materials" Khanna Publishers

12. Mehta, "Building Construction Principles, Materials & Systems" 2/e, Pearson Education Noida.

13. Sandeep Mantri, "Practical building Construction and its Management" Satya Publisher, New Delhi.

14. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros.

15. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO etc.

16. Chudley, R. Greeno, Building Construction Handbook, Butterworth

INTRODUCTION TO SOLID MECHANICS (L-T-P 3-1-0) Credit – 4

Course Outcomes: At the end of this course the student will be able to-

1. Describe the concepts and principles of stresses and strains
2. Analyze solid mechanics problems using classical methods and energy methods
3. Analyze structural members subjected to combined stresses
4. Calculate the deflections at any point on a beam subjected to a combination of loads
5. Understand the behavior of columns, springs and cylinders against loads.

UNIT I Simple stress and strains:

Concept of stress and strain, types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poission ratio, volumetric strain, elastic moduli and relation between them. Bar of varying cross section, composite bar and temperature stress. Strain energy for gradual, sudden and impact loading.

Compound stress and strains:

Normal stress and strain, shear stress and strain, stresses on inclines sections, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law-3D, Theories of failure and factor of safety.

[8 Hours]

UNIT II Shear force and bending moment diagrams

Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads. [8 Hours]

UNIT III Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. [8 Hours]

UNIT IV Deflection of Beams: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules. [8 Hours]

UNIT V Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs.

Thin cylinders, Thick cylinders & Spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders. [8 Hours]

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Yσungs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
12. Kazmi, S. M. A., “Solid Mechanics” TMH, Delhi, India.

HYDRAULIC ENGINEERING & MACHINES (L-T-P 3-1-0) Credit – 4

Course Outcomes: At the end of this course the student will be able to-

1. Apply their knowledge of fluid mechanics in addressing problems in open channels.
2. Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
3. Have knowledge in hydraulic machineries like pumps and turbines.

UNIT I Introduction : Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critical and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections. [8 Hours]

UNIT II Energy-Depth relationship: Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods. Measurments of discharge & velocity – Venturi flume, Standing wave flume, Parshall flume, Broad crested weir, Current meter and Floats. [8 Hours]

UNIT III Rapidly varied flow: Hydraulic jump; Evaluation of the jump elements in rectangular channels on horizontal and sloping beds, energy dissipater, open channel surge, celerity of the gravity wave, deep and shallow water waves. [8 Hours]

UNIT IV Impulse momentum equation- Impact of Jets-plane and curved- stationary and moving plates. Pumps: Positive displacement pumps - reciprocating pumps , centrifugal pumps, operation, velocity triangles, performance curves, Cavitation, Multi staging, Selection of pumps.

[8 Hours]

UNIT V Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves. [8 Hours]

Books and References

1. Chow,V.T. "Open Channel hydraulics" McGraw Hill Publication

2. Subramanya, K., Flow through Open Channels, TMH, New Delhi

3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi

4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press

5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.

7. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication

8. AK Jain "Fluid Mechanics" Khanna Publication.

9. Houghtalen, "Fundamentals of Hydraulics Engineering Systems" 4/e Pearson Education, Noida

MATERIAL TESTING LAB (L-T-P 0-0-2) Credit – 1

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

SOLID MECHANICS LAB (L-T-P 0-0-2) Credit – 1

Note: Students will perform minimum 10 experiments from the following:

1. Tension test on Mild Steel
2. Bending tests on simply supported beam and Cantilever beam.
3. Determination of torsion and deflection,
4. Measurement of forces on supports in statically determinate beam,
5. Determination of shear forces in beams,
6. Determination of bending moments in beams,
7. Measurement of deflections in statically determinate beam.
8. To determine Flexural Rigidity (EI) of a given beam
9. To find deflection of curved members.
10. To find Critical load in Struts with different end conditions.
11. Hardness Test (Brinnel's and Rockwell)
12. Impact test (Charpy and IZOD)

Hydraulics & Hydraulic Machine Lab (L-T-P 0-0-2) Credit – 1

Note: Students will perform minimum 10 experiments from the following:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free over-fall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. THIRD YEAR

(CIVIL ENGINEERING)

On

Choice Based Credit System

[Effective from session 2018-19]

FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS501	MANEGIRIAL ECONOMICS	Applied Science	3—0---0	70	20	10	100	3
2	RAS-502/ RUC501	SOCIOLOGY /CYBER SECURITY	Applied Science	3—0---0	70	20	10	100	3
3	RCE501	GEOTECHNICAL ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE502	DESIGN OF STRUCTURE-I	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE503	QUANTITY ESTIMATION AND MANAGEMENT	Core Deptt.	3—0---0	70	20	10	100	3
6	RCE051 RCE052 RCE053	**ELECTIVE -1** MODERN CONSTRUCTION MATERIALS CONCRETE TECHNOLOGY GEOENVIRONMENTAL	Core Deptt.	3—1--0	70	20	10	100	4

		ENGINEERING							
7	RCE551	GEOTECHNICAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
8	RCE552	CAD LAB-1	Core Deptt.	0—0---2	50		50	100	1
9	RCE553	CONSTRUCTION MANAGEMENT LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE554	CONCRETE LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

SESSION 2018-19

RCE 501 GEOTECHNICAL ENGINEERING (L-T-P 3-0-0) Credit - 3

Unit 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standard soil classification system. **[8]**

Unit 2

Soil Hydraulics: Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, uplift pressure, piping; **[8]**

Unit 3

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

Consolidation: Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, Contact pressure **[8]**

Unit 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine's approaches for frictional and c-φ soils, inclined backfill, Graphical methods of earth pressure determination, Stability of slopes , Culman method & Method of slices, Stability number & chart. **[8]**

Unit 5

Sub surface structure: Bearing capacity of shallow foundations, SPT, Plate load test; Effect of water table.

Deep foundations: Types of piles, Static and dynamic formulae, Pile group, Settlement of Pile Group, Negative skin friction. **[8]**

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.

4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
10. P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
12. Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 502 DESIGN OF STRUCTURE 1 (L-T-P 3-1-0) Credit- 4

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint by Slope-Deflection method, Moment Distribution method and Strain Energy method. **[8]**

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged and fixed arches, Influence line diagrams for maximum bending moment, Shear force and thrust in two hinge arches. Analysis of two and three hinged stiffening girders. **[8]**

Unit – 3

Introduction to Suspension Bridges, Analysis of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. **[8]**

Unit – 4

Basic Force and Displacement Matrix method for analysis of beams, frames and trusses. **[8]**

Unit – 5

Basics of Plastic Analysis. Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Single Storied Frames. **[8]**

References:

1. Jain, A. K., "Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C., "Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.

4. Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
5. Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.
6. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
7. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
8. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi.
9. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
10. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
11. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
12. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
13. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
14. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
15. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
16. S Ramamurtham "Theory of Structure" Dhanpat Rai.
17. Devdas Menon "Advanced Structural Analysis" Narosa
18. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
19. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis Group.
20. R Agor, Structural Analysis, " Khanna Book Publishing.
21. Jacques Heyman, "Structural Analysis" Cambridge University Press.

RCE 503 QUANTITY ESTIMATION & MANAGEMENT (L-T-P 3-0-0) Credit - 3

UNIT I: Quantity Estimation for Buildings

Measurement units for various building materials, Centreline method, Long and short wall method of estimates, PWD schedule of rate, Delhi schedule of rate. **[8]**

UNIT II: Rate Analysis, Specification and Tenders

Analysis of rates knowing cost of material, labour, equipment, overheads, profit, taxes etc, Specifications – Preparation of detailed and general specifications, Legal aspects of contracts, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items. **[8]**

UNIT III: Elements of Management & Network Techniques

Project cycle, Organization, planning, scheduling**,** monitoring, updating and management system

in construction, Bar charts, milestone charts, work break down structure and preparation of networks. Network Techniques like PERT & CPM in construction management. Project monitoring and resource allocation through network techniques. **[8]**

UNIT IV: Equipment Management

Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, earth compaction, Hauling Equipment, Hoisting Equipment, Conveying Equipment, Concrete Production Equipment, Tunnelling Equipment **[8]**

UNIT V: Project Cost Management

Budgeting, Cost planning, Direct Cost, Indirect cost, Total Cost Curve, Cost Slope. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method Equivalent annual cost method, discounted cash flow method, Depreciation and break even cost analysis. **[8]**

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500 004

4. Construction Management by Ojha

5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.

6. Construction Technology by Sarkar, Oxford

7. Delhi Schedule of Rates (latest version)

8. S V Deodhar and SC Sharma, "Costruction Engineering and Management, Khanna Publishing house.

RCE 051 MODERN CONSTRUCTION MATERIALS (L-T-P 3-0-0) Credit - 3

Unit – 1

Introduction, properties and uses of modern building materials: fly ash bricks, soil - cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC) , glass reinforced gypsum. **[8]**

Unit – 2

Introduction , properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals ,paints ,tiles ,bricks, glass),metals, light - weight concrete, mass concrete, waste material based concrete. **[8]**

Unit – 3

Introduction , properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, pre fabricated systems. **[8]**

Unit – 4

Introduction , properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete. **[8]**

Unit – 5

Introduction , properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials(thermal, sound and electrical insulating materials).Concept of polymer floor finishes. **[8]**

Reference Book:

1) Ghambhir M.L."Concrete Technology" Tata McGraw Hill education private Limited.
2) A.R. Santhakumar, Concrete Technology, Oxford University Press.
3) Building Materials, P.C. Varghese, Prentice-Hall India.
4) Shetty, M. S., "Concrete Technology" S. Chand Publication.
5) Krishnaraju .N., Advanced Concrete Technology, CBS Published.
6) Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
7) Nevile. A.M., Concrete Technology, Prentice Hall, Newyork.
8) Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication pvt.ltd.
9) Materials Science and Engineering, V. Raghavan, Prentice Hall.
10) Properties of Engineering Materials, R.A. Higgins, Industrial Press.
11) Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press.
12) The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall.
13) Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann.
14) The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin.
15) Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill.
16) S K Sharma, "Civil Engineering and construction material," Khanna Publuishing House.
17) Properties of concrete, A.M. Neville, Pearson.

RCE 052 CONCRETE TECHNOLOGY (L-T-P 3-0-0) Credit - 3

Unit I

Cement: production, composition properties, types and cement chemistry. Introduction to supplementary cementitious materials. Aggregates: mineralogy, properties, test and standards. Quality of water for use in concrete. **[8]**

Unit II

Introduction & study of accelerators, retarders, water reducers, air entrainers , water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume , ground granulated blast furnace slag, metakaoline and pozzolana; their production, properties and effect on concrete properties . **[8]**

Unit III

Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete: packing density, Rheology, mix design examples. **[8]**

Unit IV

Concert production, batching, mixing and transportation of concrete. Workability: test for work ability of concrete (slump test, compacting factor test and Vee Bee test). Segregation and bleeding in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules , poisson's ratio, creep, shrinkage and durability of concrete . **[8]**

Unit V

Study and uses of high strength concrete, self compacting concrete, fiber reinforced concrete, ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India. **[8]**

References

1. Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS.
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
3. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
4. Santha kumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.
5. Gupta B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
6. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS".EDT BY L.Holliday. Elsevier Publishing Company. 1966.
7. Popovics. S., "FUNDAMENTALS OF PORTLAND CEMENT CONCRETE: A Quantitative Approach VOL 1 FRESH CONCRETE" JOHN WILEY & SONS.1982.

8. P.K. Mehta and Paulo J.M. Monteiro, "Concrete: microstructure, properties and materials", The Mc Graw Hill Companies.
9. Jayant D. Bapat (2013), Mineral admixtures in cement and concrete, Taylor and Francis group.
10. Concrete mix proportioning as per IS 10262:2009 – Comparison with IS 10262:1982 and ACI 211.1-91 M.C. Nataraja and Lelin Das
11. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
12. IS456-2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi, 2000.

RCE 053 GEOENVIRONMENTAL ENGINEERING (L-T-P 3-0-0) Credit - 3

UNIT-1 Fundamentals of Geoenvironmental Engineering

Scope of geoenvironmental engineering - multiphase behaviour of soil – role of soil in geoenvironmental applications – importance of soil physics, soil chemistry, hydrogeology, biological process – sources and type of ground contamination – impact of ground contamination on geoenvironment - case histories on geoenvironmental problems. **[8]**

UNIT-2 Soil-Water-Contaminant Interaction

Soil mineralogy characterization and its significance in determining soil behaviour – soil-water interaction and concepts of double layer, forces of interaction between soil particles, concepts of unsaturated soil, water flow in saturated and unsaturated zone, soil-water-contaminant interactions and its implications, factors effecting retention and transport of contaminants. **[8]**

UNIT-3 Waste Containment System

Evolution of waste containment facilities and disposal practices, Site selection based on environmental impact assessment ,different role of soil in waste containment, different components of waste containment system and its stability issues , property evaluation for checking soil suitability for waste containment . **[8]**

UNIT-4 Contaminant Site Remediation

Site characterization, risk assessment of contaminated site, remediation methods for soil and groundwater, selection and planning of remediation methods. **[8]**

UNIT-5 Advanced Soil Characterization

Contaminant analysis, water content and permeability measurements, electrical and thermal property evaluation, use of GPR for site evaluation, introduction to geotechnical centrifuge modeling. **[8]**

Text

1. Yong, R. N., "Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation" CRC Press, New York, 2001.
2. Sharma H.D. and Reddy K.R., "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies" John Wiley & Sons, Inc., USA, 2004.
3. Fredlund D.G. and Rahardjo, H., "Soil Mechanics for Unsaturated Soils" Wiley-Interscience, USA, 1993.
4. Mitchell, J. K., "Fundamentals of Soil Behaviour" Wiley, 2005.
5. Hillel D., "Introduction to Environmental Soil Physics" Academic Press, New York, 2003.
6. Rowe R.K., "Geotechnical and Geoenvironmental Engineering Handbook" Kluwer Academic Publications, London, 2000.
7. Reddi L.N. and Inyang, H. I., "Geoenvironmental Engineering, Principles and Applications" Marcel Dekker Inc. New York, 2000.

References

1. Hillel D., "Introduction to Soil Physics" Academic Press, New York, 1982.
2. Sparks, D.L., "Environmental Soil Chemistry" Academic Press, New York, 2002.
3. Bagchi, A., "Design of landfills and integrated solid waste management" John Wiley & Sons, Inc., USA, 2004.
4. O.P. Gupta, Elements of Environmental Chemistry, Khanna Publishing House
5. Alvarez-Benedi J. and Munoz-Carpena, R., "Soil-Water-Solute Process Characterization: An Integrated Approach" CRC Press, New York, 2005.
6. Berkowitz, B. Dror, I. and Yaron, B., "Contaminant Geochemistry" Springer, Germany, 2008.
7. Mohamed, A. M. O., "Principles and Applications of Time Domain Electrometry in Geoenvironmental Engineering" Taylor and Francis, New York, 2006.
8. O P Gupta, Elements of land and soil pollution, Khanna Publishing House

RCE-551 GEOTECHNICAL ENGINEERING LAB (L-T-P 0-0-2) Credit- 1

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Determination of shear strength of soil by Direct shear test.

8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remoulded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

RCE 552 CAD LAB 1 **(L-T-P0-0-2) Credit- 1**

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

RCE 553 CONSTRUCTION MANAGEMENT LAB (L-T-P 0-0-2) Credit-1

1. Estimation of quantities for any one of the following: Building/ Septic tank/Water supply pipe line/road/bridge.
2. Preparation of Bill of Quantities (BOQ) for above project.
3. Practice of MS Project/Primavera software for same problem.
4. Study of any full set of tender documents (Institute shall provide the set from ongoing/ completed tenders).

These exercises will be done through use of software and spread in 8-10 classes.

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500 004
4. Construction Management by Ojha
5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.
6. Construction Technology by Sarkar, Oxford
7. S V Deodhar and SC Sharma, " Contruction engineering and Management", Khanna Publishing House.
7. Delhi Schedule of Rates (latest version)

RCE 554 CONCRETE LAB **(L-T-P 0-0-2) Credit- 1**

1. Study of IS codes for (i) Aggregates (ii) Cements (iii) Admixtures (iv) Fly ash
2. Concrete Mix design computation by ACI 211.1-91 method, IS code method as per 10262-2007 & 456-2000, DOE method for given sample.
3. Preparation and testing of samples as per any one of the above mentioned computations (Minimum grade of concrete is M30)
4. Tests on Concrete- (a) Workability tests - Slump cone test, compaction factor test, Vee-bee consistometer test, flow table test. (b) Strength tests- compressive strength, flexural strength, split tensile strength.
5. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
6. Non destructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

References:

1. Concrete Technology – A.M. Neville & J. J. Brooks , Pearson
2. Concrete Technology Theory & Practice-M.S. Shetty, S. Chand Publishers
3. Concrete Technology Theory & Practice-M.L. Gambhir, TMH Publishers
4. IS:10262-2009-Concrete Mix Proportioning Guidelines

SIXTH SEMESTER

CIVIL ENGINEERING

SESSION 2018-19

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS601	INDUSTRIAL MANAGEMENT	Applied Science	3—0---0	70	20	10	100	3
2	RUC601/ RAS602	CYBER SECURITY/SOCIOLOGY	Applied Science	3—0---0	70	20	10	100	3
3	RCE601	DESIGN OF STRUCTURE-II	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE602	ENVIRONMENTAL ENGINEERING	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE603	TRANSPORTATION ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
6	RCE061 REC062 RCE063	**ELECTIVE -2** FOUNDATION DESIGN INTEGRATED WASTE MANAGEMENT FOR A SMART CITY GEOSYNTHESIS AND REINFORCED SOIL STRUCTURES	Core Deptt.	3—1---0	70	20	10	100	4
7	RCE651	CAD LAB-2	Core Deptt.	0—0---2	50		50	100	1
8	RCE652	ENVIRONMENTAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
9	RCE653	TRANSPORTATION ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE 654	STRUCTURAL DETAILING LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

RCE 601 DESIGN OF STRUCTURE -II (L-T-P 3-0-0) Credits - 3

Unit – 1

Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method**.** **[8]**

Unit – 2

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear.

Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. **[8]**

Unit – 3

Design of one way, One way continuous and cantilever solid slabs by Limit State Design Method, Design of RCC staircases.

Design of lintels and chajjas. Design of two way slabs by limit state method, Serviceability Limit States, Control of deflection, cracking and vibrations. **[8]**

Unit – 4

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. **[8]**

Unit – 5

Structural behaviour of footings, Design of isolated footings, combined rectangular and trapezoidal footings by Limit State Method, Design of strap footings.

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of cantilever retaining wall by Limit State Method. **[8]**

References

1. IS: 456 – 2000.

2. Reinforced Concrete Design by S. U. Pillai & D. Menon, Tata Mc.- Graw, New Delhi

3. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.

4. Reinforced Concrete Vol. - II by H.J. Shah, Charotar Publisher, Gujarat.

5. RCC Designs (Reinforced Concrete Structures) by B.C. Punmia, Ashoka Kumar Jain and Arun Kumar Jain, Laxmi Publishers, New Delhi.

6. Reinforced Concrete Structures by R. Park and Pauley.

7. Reinforced Concrete Design by P. Dayaratnam.

8. Reinforced Concrete Design by M.L. Gambhir
9. Reinforced Concrete Design by S.N. Sinha , TMH
10. Plain and Reinforced Concrete Vol. I & II by O.P. Jain & Jai Krishna, Nem Chand & Bros.
11. SP-16: Design Aid to IS- 456.

RCE 602 ENVIRONMENTAL ENGINEERING (L-T-P 3-1-0) Credit - 4

Unit-I

Fresh water, water demands, variation in demands, population forecasting by various methods, basic needs and factors affecting consumption, design period.

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control. **[8]**

Unit-2

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Capacity of distribution reservoirs: general design guidelines for distribution system. **[8]**

Unit-3

Physical, chemical and bacteriological examination of water and wastewater: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. quality requirements, standards of water and waste water, disposal of wastewater on land and water bodies. **[8]**

Unit-4

Objectives of water treatment: unit operations, processes, and flow sheets.

Water treatment: screening, sedimentation, determination of settling velocity, efficiency of ideal sedimentation tank, design of settling tanks, grit chamber.

Primary sedimentation and coagulation, filtration: theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: requirements of an ideal disinfectant; various disinfectants, chlorination and practices of chlorination, water softening and ion-exchange process **[8]**

Unit-5

Objectives of waste water treatment: unit operations, processes, and flow sheets.

Secondary and tertiary treatment: secondary sedimentation and theory of organic matter removal.

Working of activated sludge process, trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, rotating biological contactors (RBC).

Anaerobic digestion of sludge: design of low and high rate anaerobic digesters and septic tank. Working of up flow anaerobic sludge blanket (UASB) reactor and other emerging technologies for wastewater treatment **[8]**

Text Books:

1. Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.
3. M. P. Poonia and SC Sharma: Environmental Engineering, kahnna publishing house
4. Keshav Kant, "Air Pollution Control Engineering", Khanna Publishing House
5. OP Gupta, Elements of Environmental Polluton Control, Khanna Publication
6. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Hammer and Hammer Jr.: Water and Wastewater Technology
6. Raju: Water Supply and Wastewater Engineering
7. Rao: Textbook of Environmental Engineering
8. Davis and Cornwell: Introduction to Environmental Engineering
9. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
10. Punmia: Water Supply and Wastewater Engineering Vol. I and II
11. Birdie: Water Supply and Sanitary Engineering
12. Ramalho: Introduction to Wastewater Treatment Processes
13. Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. A.K. Jain, Environmental Engineering, Khanna Publishing House

RCE 603 TRANSPORTATION ENGINEERING (L-T-P 3-0-0) Credit- 3

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan,

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, **[8]**

UNIT-2

Geometric Design(IRC:73-Latest revision): Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. **[8]**

UNIT-3

Traffic Engineering: Traffic Characteristics, Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, traffic capacity, density, traffic control devices: signs, Island, signal design by Webster's and IRC method . Intersection at grade and grade separated intersections, design of roundabouts as per IRC: 65-2017. Highway capacity and level of service of rural highways and urban roads as per latest IRC recommendation **[8]**

UNIT-4

Highway Materials: Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement : Types of Pavements, Design factors, Design of bituminous paving mixes; Design of Flexible Pavement by CBR method (IRC : 37- Latest revision), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2015) **[8]**

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads. **[8]**

Note: All designs and procedure are to be done with reference to latest revision of IRC as given below in reference section

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.
2. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
3. LR Kadiyali, Transportation Engineering, Khanna Publication.

References:

1. L.R. Kadiyali, Transportation Engineering, Khanna Publishing House
2. Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi
3. Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.
4. Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.

5. Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,
6. IRC : 37- Latest revision, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi
7. IRC:58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Fourth Revision) (with CD)
8. IRC:65-2017 Guidelines for Planning and Design of Roundabouts (First Revision)
9. IRC:73-1980 Geometric Design Standards for Rural (Non-Urban) Highways
10. IRC:106-1990 Guidelines for Capacity of Urban Roads in Plain Areas
11. IRC:93-1985 Guidelines on Design and Installation of Road Traffic Signals.
12. IRC:92-2017 Guidelines for Design of Interchanges in Urban Areas (First Revision)
13. IRC: SP: 68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
14. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
15. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

RCE 061 FOUNDATION DESIGN (L-T-P 3-0-0) Credit – 3

UNIT-1

Introduction to soil exploration, methods of boring and drilling, soil sampling and sampler, in-situ tests, SPT, CPT, DCPT, geophysical methods; soil resistivity methods seismic refraction methods. **[8]**

UNIT-2

Bearing capacity of shallow foundation, design criteria, factors affecting bearing capacity, factors influencing selection of depth of foundation, modes of shear failures, types of shallow foundations, contact pressure under rigid and flexible footings, Terzaghi's, Meyerhof, Hansen's bearing capacity theories, IS code method

Settlement of shallow foundations: components of settlement & its estimation, immediate, consolidation, & differential settlements. **[8]**

UNIT-3

Design of shallow foundation; principles of design of footing, design of isolated footings and strip footing.

Deep foundation; introduction, necessity of deep foundations, pile installation, pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, single and double under reamed piles. **[8]**

UNIT-4

Introduction, shapes and characteristics of wells, components of well foundation, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts.

Retaining walls: introduction, types of retaining structures, support systems for flexible retaining walls (struts, anchoring), construction methods, introduction and uses of sheet piles. **[8]**

UNIT-5

Geotechnical properties of reinforced soil, use of soil reinforcement, shallow foundation on soil with reinforcement, design considerations, idealized soil, foundation and interface behaviour, elastic models of soil behaviour. **[8]**

Reference Books:

1) Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
2) Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
3) Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.
4) Joseph E. Bowles: Foundation analysis and design. McGraw-Hill Higher Education
5) Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
6) Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
7) B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
8) V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Banglore
9) P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
10) I.H. Khan – Text Book of Geotechnical Engineering
11) C. Venkataramaiah – Geotechnical Engineering
12) Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
13) Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 062 INTEGRATED WASTE MANAGEMENT FOR A SMART CITY

(L-T-P 3-0-0) Credit - 3

Unit-1

Introduction: Solid Waste Management- Definition, Concept of 4Rs (reduce, reuse, recycle and recover) of waste management, Elements of a waste management system, Current Issues in Solid Waste Management, Integrated Waste Management Hierarchy: Source reduction, Recycling, Waste-to-Energy and Land filling. Review of waste management under Swachh Bharat Mission and Smart Cities Program. **[8]**

Unit-2

Municipal Solid Waste: Waste Composition and Quantities**,** Collection, Transportation, Segregation, and Processing. **[8]**

Unit-3

Disposal of Municipal Solid Waste: Landfill, Biochemical Processes and Composting, Energy Recovery from Municipal Solid Waste. Municipal Solid Waste (MSW) Rules 2016. **[8]**

Unit-4

Construction and Demolition (C&D) Waste Management: Overview, Components; C&D Waste Management Rules 2016, Beneficial Reuse of C & D Waste Materials. **[8]**

Unit-5

Electronic Waste (E-Waste) Management – Issues and Status in India and Globally, E-Waste Management Rules 2016 and Management Challenges.

Hazardous Wastes: Definition, Classification, Risk assessment, Transportation of hazardous waste, Current Management Practices: Environmental audit, Containment, Remedial alternatives. **[8]**

Books:

1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., *Management of Municipal Solid Waste*, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, *Solid Waste Management*; 2009, PHI.

References:

1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website
3. Construction and Demolition Waste Management Rules, 2016, MoEF&CC
4. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.
5. O P Gupta, " Element of Solid waste hazardous management, Khanna Publishing house.
6. Freeman, M. H.1988. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Book Company, New York
7. http://swachhbharatmission.gov.in/sbmcms/index.htm
8. http://swachhbharaturban.gov.in/

RCE 063 GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

(L-T-P 3-0-0) Credit - 3

UNIT 1

Introduction to Geosynthetics, types of geosynthetics, artificial and natural geosythetics and their applications, manufacture of geosynthetics, strength of reinforced soils, testing of Geosynthetics. **[8]**

UNIT-2

Drainage application of geosynthetics , filtration applications of geosynthetics, erosion control using geosynthetics geosyntheitcs in flexible payment, introduction to geosyenthitcs in landfills, geosynthetics for construction of landfills **[8]**

UNIT-3

Sustainable infrastructure development, different types of soil retaining structures, design codes for reinforced soil retaining walls, construction aspects of geosythetics reinforced soil retaining wall, testing requirements for reinforced soil retaining walls, geosynthetic reinforced soil embankments. **[8]**

UNIT-4

Design of reinforced soil retaining walls – simple geometry, design of reinforced soil retaining walls – sloped backfill soil, soil embankments supported on geocell mattresses, geosynthetic reinforced pile systems for high embankments **[8]**

UNIT-5

Reinforced soil for supporting shallow foundations, response of footings resting on reinforced foundation soils, bearing capacity analysis of footings resting on reinforced foundation soils, carbon footprint analysis **[8]**

REFERENCES

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
3. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.
4. Hoe I. Ling, Guido Gottardi , Daniele Cazzuffi , Jie Han , Fumio Tatsuoka “Design and Practice of Geosynthetic-Reinforced Soil Structures”
5. Sanjay Kumar Shukla, Erol Guler “Advances in Reinforced Soil Structures”

RCE 651 CAD LAB- 2 (L-T-P 0-0-2) Credit - 1

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)

2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.

3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)

RCE 652 ENVIRONMENTAL ENGINEERING LAB (L-T-P 0-0-2) Credit -1

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM10 with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total , suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of a nearby area.

Note: 1. Experiment at S.NO. 14 is mandatory.

2. Any 8 Experiments out of the S.NO 1 to 13 are to be performed.

References:

1. A.P.H.A. “Standard Methods for the Examination of Water andWastewater”, American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. “Chemistry for Environmental Engineering”, Mc-Graw Hill.
3. Mathur, R.P. “Water & Wastewater Testing”, Lab Manual, Roorkee.
4. O P Gupta, Environmental Chemistry, " Khanna Publishing house.

RCE 653 TRANSPORTATION ENGINEERING LAB (L-T-P 0-0-2) Credit - 1

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.

10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
2. Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.
3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

RCE 654 STRUCTURAL DETAILING LAB (L-T-P 0-0-2) Credit - 1

1. Study of SP34/IS13920/IS456:2000 for detailing of structural elements.
2. Preparation of working hand sketches and Auto CAD drawings for the following-
    - RC Beams- Simply supported, Continuous, Cantilever
    - T – beam / L-beam floor
    - Slabs – Simply supported, Continuous, One way and two way slabs.
    - Columns – Tied Columns and Spirally reinforced columns.
    - Isolated footings for RC Columns.
    - Combined rectangular and trapezoidal footings.
3. Preparation of bar bending schedule
4. Detailing of Buildings with respect to Earthquake Resistant Design
5. Study of full set of structural drawing of a building as made available by Institute.

References: Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd., Hyderabad.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

OPEN ELECTIVE-I

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

OPEN ELECTIVE-II

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (*λ*), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial

processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI

6. French, R.H., Open channel Hydraulics, McGraw Hill International

7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of

power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken's approach, Ford & Haddow's analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods. **2**

UNIT-III Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. **8**

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARACH

L T P
3 1 0

UNIT-I

Introduction:

Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme

technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Evaluation Scheme & Syllabus

For

B.Tech. 2nd Year

(Computer Science and Engineering/CS/CSIT)

On

AICTE Model Curriculum

(Effective from the Session: 2019-20)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B.TECH (COMPUTER SCIENCE AND ENGINEERING)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ KAS302	Engineering Science Course/Maths IV	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE 301	Technical Communication/Universal Human values	2 3	1 0	0 0	30	20	50		100		150	3
3	KCS301	Data Structure	3	1	0	30	20	50		100		150	4
4	KCS302	Computer Organization and Architecture	3	1	0	30	20	50		100		150	4
5	KCS303	Discrete Structures & Theory of Logic	3	0	0	30	20	50		100		150	3
6	KCS351	Data Structures Using C Lab	0	0	2				25		25	50	1
7	KCS352	Computer Organization Lab	0	0	2				25		25	50	1
8	KCS353	Discrete Structure & Logic Lab	0	0	2				25		25	50	1
9	KCS354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										**950**	**22**

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV													
Sl. No.	**Subject Codes**	**Subject**	**Periods**			**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
			L	**T**	**P**	**CT**	**TA**	**Total**	**PS**	**TE**	**PE**		
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS301	Universal Human Values/ Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KCS401	Operating Systems	3	0	0	30	20	50		100		150	3
4	KCS402	Theory of Automata and Formal Languages	3	1	0	30	20	50		100		150	4
5	KCS403	Microprocessor	3	1	0	30	20	50		100		150	4
6	KCS451	Operating Systems Lab	0	0	2				25		25	50	1
7	KCS452	Microprocessor Lab	0	0	2				25		25	50	1
8	KCS453	Python Language Programming Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										**900**	**21**

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
THIRD SEMESTER (DETAILED SYLLABUS)

DATA STRUCTURE (KCS301)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	**K_1, K_2**
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	**K_2**
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	**K_3**
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	**K_4**
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	**K_5, K_6**
DETAILED SYLLABUS		**3-1-0**

Unit	Topic	Proposed Lecture
I	**Introduction:** Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) **Arrays**: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	**Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. **Sorting:** Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08
IV	**Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.	08

V	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, "Data Structure Using C" Oxford Higher Education.
5. AK Sharma, "Data Structure Using C", Pearson Education India.
6. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
8. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
9. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
12. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

Computer Organization and Architecture (KCS302)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Study of the basic structure and operation of a digital computer system.	K_1, K_2
CO 2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.	K_2, K_4
CO 3	Implementation of control unit techniques and the concept of Pipelining	K_3
CO 4	Understanding the hierarchical memory system, cache memories and virtual memory	K_2
CO 5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	K_2, K_4

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction**: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	**08**
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	**08**
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	**08**
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	**08**
V	**Input / Output**: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	**08**

Text books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)

Discrete Structures & Theory of Logic (KCS303)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Write an argument using logical notation and determine if the argument is or is not valid.	K_3, K_4
CO 2	Understand the basic principles of sets and operations in sets.	K_1, K_2
CO 3	Demonstrate an understanding of relations and functions and be able to determine their properties.	K_3
CO 4	Demonstrate different traversal methods for trees and graphs.	K_1, K_4
CO 5	Model problems in Computer Science using graphs and trees.	K_2, K_6

DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Set Theory**: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. **Natural Numbers:** Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.	**08**
II	**Algebraic Structures:** Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	**08**
III	**Lattices**: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	**08**
IV	**Propositional Logic:** Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) **Predicate Logic:** First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.	**08**
V	**Trees:** Definition, Binary tree, Binary tree traversal, Binary search tree. **Graphs:** Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. **Combinatorics**: Introduction, Counting Techniques, Pigeonhole Principle	**08**

Text books:

1.Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.

2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.

3.E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.

4.R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004

5.Liptschutz, Seymour, " Discrete Mathematics", McGraw Hill.

6.Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.

4. Deo, 7.Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.

8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi

Data Structure using C Lab (KCS351)

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Computer Organization Lab (KCS352)

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

Discrete Structure & Logic Lab (KCS353)

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersectison operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT .
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings (exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
21. Baseball best-of-5 series: Experimental probabilities
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)

FOURTH SEMESTER (DETAILED SYLLABUS)

Operating systems (KCS401)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the structure and functions of OS	K_1, K_2
CO 2	Learn about Processes, Threads and Scheduling algorithms.	K_1, K_2
CO 3	Understand the principles of concurrency and Deadlocks	K_2
CO 4	Learn various memory management scheme	K_2
CO 5	Study I/O management and File systems.	K_2,K_4
DETAILED SYLLABUS		**3-0-0**

Unit	Topic	Proposed Lecture
I	**Introduction** : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	**Concurrent Processes**: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	**CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	**Memory Management:** Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08
V	**I/O Management and Disk Scheduling**: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

Theory of Automata and Formal Languages (KCS402)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K_4, K_6
CO 2	Analyse and design, Turing machines, formal languages, and grammars	K_4, K_6
CO 3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	K_1, K_5
CO 4	Prove the basic results of the Theory of Computation.	K_2,K_3
CO 5	State and explain the relevance of the Church-Turing thesis.	K_1, K_5

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Basic Concepts and Automata Theory:** Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA	**08**
II	**Regular Expressions and Languages:** Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	**08**
III	**Regular and Non-Regular Grammars**: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	**08**
IV	**Push Down Automata and Properties of Context Free Languages**: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	**08**
V	**Turing Machines and Recursive Function Theory** : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory.	**08**

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age Internationa

Microprocessor (KCS403)		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.	K_3, K_4
CO 2	Analyze a detailed s/w & h/w structure of the Microprocessor.	K_2,K_4
CO 3	Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor.	K_3
CO 4	Analyze the properties of Microprocessors(8085/8086)	K_4
CO 5	Evaluate the data transfer information through serial & parallel ports.	K_5

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Interfacing devices.	**08**
II	Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Addressing modes. Instruction formats Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives.	**08**
III	Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes. Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts.	**08**
IV	Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions	**08**
V	Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C.	**08**

Text books:

1. Gaonkar, Ramesh S , "Microprocessor Architecture, Programming and Applications with
2. 8085", Penram International Publishing.
3. Ray A K , Bhurchandi K M , "Advanced Microprocessors and Peripherals", TMH
4. Hall D V ,"Microprocessor Interfacing', TMH
5. Liu and, " Introduction to Microprocessor", TMH
6. Brey, Barry B, "INTEL Microprocessors", PHI
7. Renu Sigh & B.P. Gibson G A , " Microcomputer System: The 8086/8088 family'' ,PHI
8. Aditya P Mathur Sigh, "Microprocessor, Interfacing and Applications M Rafiqzzaman, "Microprocessors, Theory and Applications
9. J.L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson, 1999

Operating Systems Lab (KCS451)

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8
2. Execute various UNIX system calls for
    i. Process management
    ii. File management
    iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
    i. SJF
    ii. Priority
    iii. FCFS
    iv. Multi-level Queue
4. Implement file storage allocation technique:
    i. Contiguous(using array)
    ii. Linked –list(using linked-list)
    iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
    i. Worst-Fit
    ii. Best- Fit
    iii. First- Fit
6. Calculation of external and internal fragmentation
    i. Free space list of blocks from system
    ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker"s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

Microprocessor Lab (KCS452)

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port**.**

Python Language Programming Lab (KCS453)

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton's method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.
10. To write a python program selection sort.
11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

For

B. Tech. Third Year

(Computer Science and Engineering)

(Computer Science and Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2018-19)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. Tech. (CSE\CSIT)
FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS501	MANEGERIAL ECONOMICS	3---0---0	70	20	10	100	3
2	RAS502/ RUC501	INDUSTRIAL SOCIOOLOGY /CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-501	Database Management Systems	3---0---0	70	20	10	100	3
4	RCS-502	Design and Analysis of Algorithm	3---1---0	70	20	10	100	4
5	RCS-503	Principles of Programming Languages	3---0---0	70	20	10	100	3
6	CS-Elective-1	DEPTT ELECTIVE COURSE-1	3---1---0	70	20	10	100	4
7	RCS-551	Database Management Systems Lab	0---0---2	50	-	50	100	1
8	RCS-552	Design and Analysis of Algorithm Lab	0---0---2	50	-	50	100	1
9	RCS-553	Principles of Programming Languages Lab	0---0---2	50	-	50	100	1
10	RCS-554	Web Technologies Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

SIXTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS601	INDUSTRIAL MANAGEMENT	3---0---0	70	20	10	100	3
2	RAS602 / RUC601	INDUSTRIAL SOCIOLOGY/ CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-601	Computer Networks	3---0---0	70	20	10	100	3
4	RCS-602	Compiler Design	3---1---0	70	20	10	100	4
5	RCS-603	Computer Graphics	3---0---0	70	20	10	100	3
6	CS-Elective-2	DEPTT ELECTIVE COURSE-2	3---1---0	70	20	10	100	4
7	RCS-651	Computer Networks Lab	0---0---2	50	-	50	100	1
8	RCS-652	Compiler Design Lab	0---0---2	50	-	50	100	1
9	RCS-653	Computer Graphics Lab	0---0---2	50	-	50	100	1
10	RCS-654	Data Warehousing & Data Mining Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

DEPARTMENTAL ELECTIVES

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT

RIT-052: SOFTWARE TESTING & AUDIT

RCS-051: OPERATION RESEARCH

RCS-052: WEB TECHNOLOGIES

CS-ELECTIVE-2: Computer Science Departmental Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS

RIT-062: DATAWAREHOUSING & DATA MINING

RCS-061: INTERNET OF THINGS

RCS-062: NEURAL NETWORK

B. Tech. (CSE\CSIT)
FIFTH EMESTER (DETAILED SYLLABUS)

RCS-501:Database Management Systems		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

References:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-502: Design and Analysis of Algorithm		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**08**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	**08**
III	**Divide and Conquer** with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	**08**
IV	**Dynamic Programming** with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**08**
V	**Selected Topics:** Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms	**08**

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Gajendra Sharma, Design & Analysis of Algorithms, Khanna Publishing House
6. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
7. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
8. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
9. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
10. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
11. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
12. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

RCS-503: Principles of Programming Languages		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Role of Programming Languages: Why Programming Languages, Towards Higher-Level Languages, Programming Paradigms, Programming Environments Language Description: Syntactic Structure, Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models	**08**
II	**Data, Data Types, and Basic Statements** : Names , Variables , Binding, Type Checking, Scope, Scope Rules , Lifetime and Garbage Collection, Primitive Data Types, Strings, Array Types, Associative Arrays ,Record Types, Union Types, Pointers and References , Arithmetic Expressions , Overloaded Operators, Type Conversions , Relational and Boolean Expressions, Assignment Statements, Mixed Mode Assignments, Control Structures, Selection ,Iterations, Branching, Guarded Statements	**08**
III	**Subprograms and Implementations** : Subprograms, Design Issues, Local Referencing, Parameter Passing, Overloaded Methods, Generic Methods, Design Issues for Functions , Semantics of Call and Return, Implementing Simple Subprograms, Stack and Dynamic Local Variables, Nested Subprograms, Dynamic Scoping.	**08**
IV	**Object-Orientation, Concurrency, and Event Handling** : Grouping of Data and Operations — Constructs for Programming Structures, Abstraction Information Hiding, Program Design with Modules, Defined Types, Object Oriented Programming — Concept of Object, Inheritance, Derived Classes and Information Hiding – Templates, Semaphores, Monitors, Message Passing, Threads, Statement Level Concurrency Exception Handling (Using C++ and Java as Example Language).	**08**
V	**Functional and Logic Programming Languages** : Introduction to Lambda Calculus , Fundamentals of Functional Programming Languages, Programming with Programming with ML, Introduction to Logic and Logic Programming – Programming with Prolog.	**08**

References:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal, Fourth ed., Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England
5. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Software Project Planning**: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope Document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project Plan, Structure of a Software Project Management Plan, Software Project Estimation, Estimation Methods, Estimation Models, Decision Process.	**08**
II	**Project Organization and Scheduling Project Elements:** Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts	**08**
III	**Project Monitoring and Control:** Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.	**08**
IV	**Software Quality Assurance and Testing Objectives**: Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & Validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of Correctness, Statistical Quality Assurance, Cleanroom Process.	**08**
V	**Project Management and Project Management Tools Software Configuration Management:** Software Configuration Items and Tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and Risk Types, Risk Breakdown Structure (RBS), Risk Management Process: Risk Identification, Risk Analysis, Risk Planning, Risk Monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.	**08**

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment “A Systems Approach to Planning, Scheduling, and Controlling” Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.
7. P.K. Agarwal, SAM R., Software Project Management, Khanna Publishing House

RIT-052: SOFTWARE TESTING & AUDIT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Review of Software Engineering**: Overview of Software Evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference Between Verification and Validation, Test Cases, Testing Suite, Test ,Oracles, Impracticality of Testing All Data; Impracticality of Testing AllPaths. **Verification:** Verification Methods, SRS Verification, Source Code Reviews, User Documentation Verification, Software, Project Audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection and Configuration Audits.	**08**
II	**Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. **Structural Testing**: Control Flow Testing, Path Testing, Independent Paths, Generation of Graph from Program, Identification of Independent Paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing	**08**
III	**Regression Testing:** What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique. **Reducing the number of test cases**: Prioritization guidelines, Priority category, Scheme, Risk Analysis.	**08**
IV	**Software Testing Activities:** Levels of Testing, Debugging, Testing techniques and their applicability, Exploratory Testing **Automated Test Data Generation:** Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.	**08**
V	**Object Oriented Testing:** Definition, Issues, Class Testing, Object Oriented Integration and System Testing. **Testing Web Applications:** Web Testing, User Interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.	**08**

References:

1 Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012

2. K..K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.

3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.

4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.

5. M.C. Trivedi, Software Testing & Audit, Khanna Publishing House

6. Boris Beizer, “Software System Testing and Quality Assurance”, Van Nostrand Reinhold, New York, 1984.

RCS-051: OPERATION RESEARCH		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	Definition and Scope of Operations Research (OR), OR Model, Solving the OR Model, Art of Modelling, Phases of OR Study. Linear Programming: Two Variable Linear Programming Model and Graphical Method of Solution, Simplex Method, Dual Simplex Method, Special Cases of Linear Programming, Duality, Sensitivity Analysis.	**08**
II	Transportation Problems: Types of Transportation Problems, Mathematical Models, Transportation Algorithms, Assignment: Allocation and Assignment Problems and Models, Processing of Job through Machines.	**08**
III	Network Techniques: Shortest Path Model, Minimum Spanning Tree Problem, Max-Flow Problem and Min-Cost Problem. Project Management: Phases of Project Management, Guidelines for Network Construction, CPM and PERT.	**08**
IV	Theory of Games : Rectangular Games, Minimax Theorem, Graphical Solution of 2 x n or m x 2 Games, Game with Mixed Strategies, Reduction to Linear Programming Model. Quality Systems: Elements of Queuing Model, Generalized Poisson Queuing Model, Single Server Models.	**08**
V	Control: Models of Inventory, Operation of Inventory System, Quantity Discount. Replacement Models: Equipment's that Deteriorate with Time, Equipment's that Fail with Time.	**08**

References:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.
5. T.Veerarajan "Operation Research" Universities Press

RCS-052: WEB TECHNOLOGIES		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking** **:** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	**08**

References:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Tanveer Alam, Internet & Java Programming, Khanna Publishing House
5. Bhave, “Programming with Java”, Pearson Education
6. Herbert Schieldt, “The Complete Reference:Java”, TMH.
7. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
8. Margaret Levine Young, “The Complete Reference Internet”, TMH
9. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
10. Balagurusamy E, “Programming in JAVA”, TMH

RCS-551 Database Management Systems Lab

Objectives :

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
    a)Writing basic SQL SELECT statements.
    b) Restricting and sorting data.
    c)Displaying data from multiple tables.
    d)Aggregating data using group function.
    e)Manipulating data.
    e)Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files

RCS-552 Design and Analysis of Algorithm Lab

Objective:-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Knapsack Problem using Greedy Solution
8. Perform Travelling Salesman Problem
9. Find Minimum Spanning Tree using Kruskal's Algorithm
10. Implement N Queen Problem using Backtracking

RCS-553 Principles of Programming Languages Lab

Objective:-

1. Program for linear search in ML
2. Program for binary search in ML
3. Program for insertion sort in ML
4. Program for bubble sort in ML
5. Program for merge sort in ML
6. Program for Quick sort in ML
7. Program for making a dictionary in ML
8. Program for merging two unsorted-students-name-list in sorted order

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-554 Web Technologies Lab

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
3. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed .
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12. Design and implement a simple shopping cart example with session tracking API.

B. Tech. (CSE\CSIT)
SIXTH EMESTER (DETAILED SYLLABUS)

RCS-601: COMPUTER NETWORKS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling	**08**
II	**Medium Access sub layer:** Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	**08**
III	**Network Layer:** Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	**08**
IV	**Transport Layer**: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	**08**
V	**Application Layer:** Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks	**08**

REFRENCES:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Bhavneet Sidhu, An Integrated approach to Computer Networks, Khanna Publishing House
5. .Gary R.Wright,W.Richard Stevens "TCP/IP Illustrated,Volume2 The Implementation" Addison-Wesley
6. Michael A. Gallo and William M. Hancock "Computer communucation and Networking Technology" Cengage Learning
7. Anuranjan Misra, “Computer Networks”, Acme Learning
8. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

RCS-602: COMPILER DESIGN		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

REFRENCES:

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill,2003.
3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
5. V Raghvan, “ Principles of Compiler Design”, TMH
6. Kenneth Louden,” Compiler Construction”, Cengage Learning.
7. Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education

RCS-603: COMPUTER GRAPHICS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays-Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	**08**
IV	**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
V	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**08**

REFRENCES:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education.
3. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill
4. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – Tata MCGraw Hill.
5. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.
6. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.
7. M.C. Trivedi, NN Jani, Computer Graphics & Animations, Jaico Publications
8 Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
9. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
10. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education

CS-ELECTIVE -2: Computer Science and Engineering Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION:** Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	**08**
II	**BASIC DESIGN:** Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.	**08**
III	**ADVANCED DESIGN:** Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	**08**
IV	**TECHNOLOGY I – ANDROID:** Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-Fi – Integration with social media applications.	**08**
V	**TECHNOLOGY II – iOS:** Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift.	**08**

REFRENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore, apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
6. Development: Exploring the iOS SDK”, Apress, 2013.

RIT-062: DATAWAREHOUSING & DATA MINING		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Data Warehousing:** Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept	**08**
II	**Data Warehouse Process and Technology:** Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,	**08**
III	**Data Mining:** Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	**08**
IV	**Classification**: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods- DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	**08**
V	**Data Visualization and Overall Perspective:** Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	**08**

REFRENCES:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. I. Singh, Data Mining and Warehousing, Khanna Publishing House
4. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
5. Arun K. Pujari, “Data Mining Techniques” Universities Press
6. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

RCS-061: INTERNET OF THINGS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . **Design Principles for Connected Devices:** IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.	**08**
II	**Hardware for IoT:** Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	**08**
III	**Network & Communication Aspects in IoT:** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**08**
IV	**Programming the Ardunio:** Ardunio platform boards anatomy, ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.	**08**
V	**Challenges in IoT Design Challenges**: Development challenges, Security challenges, Other challenges **IoT Applications** : Smart metering, e-health, city automation, automotive applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	**08**

References:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publicatiosn
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti " Internet of Things(A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,HakinCassimally "Designing the Internet of Things" Wiley India

RCS-062: NEURAL NETWORK		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Neuro Computing and Neuroscience**: Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	**08**
II	**Data Processing Scaling:** Normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perception, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	**08**
III	**Multilayered Network Architecture:** Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	**08**
IV	**Recurrent Network and Temporal Feed-Forward Network:** Implementation with BP, self-Organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing	**08**
V	**Complex Valued NN and Complex Valued BP:** Analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration	**08**

REFRENCES:

1. 1.J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Munesh Chandra Trivedi, NN Jani, Artificial Neural Network Technology, Khanna Publishing House
5. Kosko, Neural Network and Fuzzy Sets, PHI 5. Hagan, Neural Network Design w/CD,Cengage Learning

RCS-651: COMPUTER NETWORKS LAB

1. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
2. Configuration of router, hub, switch etc. (using real devices or simulators)
3. Running and using services/commands like ping, trace route, nslookup, arp, telnet, ftp, etc.
4. Network packet analysis using tools like Wireshark, tcpdump, etc.
5. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
6. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)
7. Programming using raw sockets
8. Programming using RPC

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-652: COMPILER DESIGN LAB

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-653: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6. To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7. To implement Liang Barksy Line Clipping Algorithm.
8. To perform 3D Transformations such as translation, rotation and scaling.
9. To convert between color models.
10. To perform animation using any Animation software
11. To perform basic operations on image using any image editing software
12. To draw different shapes such as hut, face, kite, fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-654: Data Warehousing & Data Mining Lab

It is expected that student should implement concept of Data Mining and Warehousing. The open source Data Mining Tools like Rapid Miner, Weka etc. can be used to implement the concept of Data Mining and Warehousing. Some examples are as follows (Subject Teacher may add more):

1. Implementation of OLAP operations
2. Implementation of Varying Arrays
3. Implementation of Nested Tables
4. Demonstration of any ETL tool
5. Write a program of Apriori algorithm using any programming language.
6. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
7. Demonstration of Association rule process on data-set contact lenses.arff /supermarket (or any other data set) using apriori algorithm.
8. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
9. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
10. Demonstration of clustering rule process on data-set iris.arff using simple k-means.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Evaluation Scheme & Syllabus

For

B.Tech. Fourth Year

(Computer Science and Engineering/Computer Science)

On

Choice Based Credit System

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B.Tech. (Computer Science and Engineering)
VII SEMESTER

SI. No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	Open Elective-1	Open Elective Course -1	3--0--0	70	20	10	100	3
2	CS Elective-3	Deptt Elective Course-3	3--0--0	70	20	10	100	3
3	CS Elective-4	Deptt Elective Course-4	3--1--0	70	20	10	100	4
4	RCS701	Distributed System	3--1--0	70	20	10	100	4
5	RCS702	Artificial Intelligence	3--0--0	70	20	10	100	3
6	RCS751	Distributed System Lab	0--0--2	50		50	100	1
7	RCS752	Artificial Intelligence Lab	0--0--2	50		50	100	1
8	RCS753	Industrial Training	0--0--3			100	100	2
9	RCS754	Project	0--0--6			200	200	3
	TOTAL			450	100	450	1000	24

B.Tech. (Computer Science and Engineering)
VIII SEMESTER

SI. No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	Open Elective-2	Open Elective Course-2	3--0--0	70	20	10	100	3
2	CS Elective-5	Deptt Elective Course-5	3--1--0	70	20	10	100	4
3	CS Elective-6	Deptt Elective Course-6	3--0--0	70	20	10	100	3
4	RCS851	Seminar	0--0--3			100	100	2
5	RCS852	Project	0--0--12	350		250	600	12
	TOTAL			560	60	380	1000	24

DEPARTMENTAL ELECTIVES

CS-ELECTIVE -3:

1. RCS070 Embedded Systems
2. RCS071 Application of Soft Computing
3. RCS072 High Performance Computing
4. RCS073 Human Computer Interface

CS-ELECTIVE-4:

1. RCS075 Cloud Computing
2. RCS076 Blockchain Architecture Design
3. RCS077 Agile Software Development
4. RCS078 Augmented & Virtual Reality

CS-ELECTIVE-5:

1. RCS080 Machine Learning (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc17_cs17/preview https://onlinecourses.nptel.ac.in/noc17_cs26/preview)
2. RCS081 Game Programming
3. RCS082 Image Processing (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_ee40/preview https://nptel.ac.in/courses/106105032/
4. RCS083 Parallel and Distributed Computing (Mapping with MOOCS: https://nptel.ac.in/courses/106102114/, https://nptel.ac.in/courses/106104024/)

CS-ELECTIVE-6:

1. RCS085 Speech Natural language processing (Mapping with MOOCS: https://nptel.ac.in/courses/106101007/ https://nptel.ac.in/courses/106105158/)
2. RCS086 Deep Learning (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_cs41/preview)
3. RCS087 Data Compression
4. RCS088 Quantum Computing (Mapping with MOOCS: https://onlinecourses.nptel.ac.in/noc18_cy07**)**

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)

VII & VIII SEMESTER (DETAILED SYLLABUS)

DISTRIBUTED SYSTEM		
DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Characterization of Distributed Systems**: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.	**08**
II	**Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.	**08**
III	**Agreement Protocols:** Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.	**08**
IV	Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols	**08**
V	**Transactions and Concurrency Control**: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.	**08**

Text books:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

3. Vijay K.Garg Elements of Distributed Compuitng , Wiley

4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education 5. Tenanuanbaum, Steen," Distributed Systems", PHI

ARTIFICIAL INTELLIGENCE		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.	**08**
II	**Introduction to Search :** Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning	**08**
III	**Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.	**08**
IV	**Machine Learning :** Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,	**08**
V	**Pattern Recognition :** Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.	**08**

Text books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education

2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill

3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education

4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

DISTRIBUTED SYSTEM LAB

The following programs may be developed preferably on ‘UNIX’ platform:-

1. Simulate the functioning of Lamport’s Logical Clock in ‘C’.
2. Simulate the Distributed Mutual Exclusion in ‘C’.
3. Implement a Distributed Chat Server using TCP Sockets in ‘C’.
4. Implement RPC mechanism for a file transfer across a network in ‘C’
5. Implement ‘Java RMI’ mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in ‘C’.
7. Implement CORBA mechanism by using ‘C++’ program at one end and ‘Java program on the other.

Artificial Intelligence Lab

The following programs may be developed -

1.Study of Prolog.

2 Write simple fact for the statements using PROLOG.

3 Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.

4 Write a program to solve the Monkey Banana problem.

5 WAP in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts.

6 WAP to implement factorial, fibonacci of a given number.

7 Write a program to solve 4-Queen problem.

8 Write a program to solve traveling salesman problem.

9 Write a program to solve water jug problem using LISP

EMBEDDED SYSTEMS		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Embedded Systems:** Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.	**08**
II	**Embedded Networking**: Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.	**08**
III	**Embedded Firmware Development Environment**: Embedded Product Development Life Cycle-objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.	**08**
IV	**RTOS Based Embedded System Design:** Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.	**08**
V	**Embedded System Application Development:** Design issues and techniques Case Study of Washing Machine- Automotive Application- Smart card System Application.	**08**

Text books:

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006.
2. Michael J. Pont, “Embedded C”, Pearson Education , 2007.
3. Steve Heath, “Embedded System Design”, Elsevier, 2005.
4. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, “The 8051
5. Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.

APPLICATION OF SOFT COMPUTING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Neural Networks-I (Introduction & Architecture) :** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory.	**08**
II	**Neural Networks-II (Back propogation networks):** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.	**08**
III	**Fuzzy Logic-I (Introduction):** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.	**08**
IV	**Fuzzy Logic –II (Fuzzy Membership, Rules)** : Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications	**08**
V	**Genetic Algorithm(GA):** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.	**08**

Text books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.

2. N.P.Padhy,”Artificial Intelligence and Intelligent Systems” Oxford University Press. Reference Books:

3. Siman Haykin,”Neural Netowrks”Prentice Hall of India

4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

5. Kumar Satish, “Neural Networks” Tata Mc Graw Hill

HIGH PERFORMANCE COMPUTING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High-Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.	**08**
II	Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.	**08**
III	Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,	**08**
IV	Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).	**08**
V	Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.	**08**

Text books:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley

2. Ahmar Abbas, “Grid Computing: Practical Guide to Technology & Applications”, Firewall Media, 2004.

3. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004.

4. lan Foster, et al.,“The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.

6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. PrenticeHall India, 1999.

HUMAN COMPUTER INTERFACE		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction :** Importance of user Interface – definition, importance of 8 good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface	**08**
II	**Design process:** Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions. III Screen Designing : Design goals – Scre	**08**
III	**Screen Designing :** Design goals – Screen planning and purpose, 8 organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	**08**
IV	**Windows :** New and Navigation schemes selection of window, 8 selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors	**08**
V	**Software tools :** Specification methods, interface – Building Tools. 8 Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	**08**

Text books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.

2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

3. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0- 321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

CLOUD COMPUTING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION** Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	**08**
II	**CLOUD ENABLING TECHNOLOGIES** Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.	**08**
III	**CLOUD ARCHITECTURE, SERVICES AND STORAGE** Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	**08**
IV	**RESOURCE MANAGEMENT AND SECURITY IN CLOUD** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.	**08**
V	**CLOUD TECHNOLOGIES AND ADVANCEMENTS** Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.	**08**

Text books:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

BLOCKCHAIN ARCHITECTURE DESIGN		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Blockchain**: Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms	**08**
II	**Consensus:** Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols Permissioned Blockchains:Design goals, Consensus protocols for Permissioned Blockchains	**08**
III	**Hyperledger Fabric (A):** Decomposing the consensus process , Hyperledger fabric components, Chaincode Design and Implementation **Hyperledger Fabric (B):** Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool	**08**
IV	**Use case 1 :** Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv) Insurance **Use case 2:** Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc	**08**
V	**Use case 3**: Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain	**08**

Text books:

1. Mstering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

AGILE SOFTWARE DEVELOPMENT		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**AGILE METHODOLOGY** Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values	08
II	**AGILE PROCESSES** Lean Production – SCRUM, Crystal, Feature Driven Development- Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.	08
III	**AGILITY AND KNOWLEDGE MANAGEMENT** Agile Information Systems – Agile Decision Making – Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).	08
IV	**AGILITY AND REQUIREMENTS ENGINEERING** Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.	08
V	**AGILITY AND QUALITY ASSURANCE** Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development.	08

Text books:

1.David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
2.Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
3.Craig Larman, "Agile and Iterative Development: A Managers Guide", Addison-Wesley, 2004.
4.Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

AUGMENTED & VIRTUAL REALITY		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**VIRTUAL REALITY AND VIRTUAL ENVIRONMENTS:** The historical development of VR: Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality. HARDWARE TECHNOLOGIES FOR 3D USER INTERFACES: Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.	**08**
II	**3D USER INTERFACE INPUT HARDWARE:** Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interfaces.	**08**
III	**SOFTWARE TECHNOLOGIES:** Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market	**08**
IV	**3D INTERACTION TECHNIQUES:** 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3D Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations of Wayfinding, User Centered Wayfinding Support, Environment Centered Wayfinding Support, Evaluating Wayfinding Aids, Design Guidelines - System Control, Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design Guidelines, Beyond Text and Number entry . **DESIGNING AND DEVELOPING 3D USER INTERFACES:** Strategies for Designing and Developing Guidelines and Evaluation. **VIRTUAL REALITY APPLICATIONS:** Engineering, Architecture, Education, Medicine, Entertainment, Science, Training.	**08**
V	Augmented and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.	**08**

Text books:

1. Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.

2. Gerard Jounghyun Kim, “Designing Virtual Systems: The Structured Approach”, 2005.

3. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”,

Addison Wesley, USA, 2005.

4. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.

5. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

6. John Vince, "Virtual Reality Systems", Addison Wesley, 1995.

7. Howard Rheingold, "Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society", Simon and Schuster, 1991.

8. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002

9. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

MACHINE LEARNING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	INTRODUCTION – Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNING TASK - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias	**08**
II	DECISION TREE LEARNING - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation AlgorithmConvergence, Generalization;	**08**
III	Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; **Bayesian Learning:** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm;	**08**
IV	**Computational Learning Theory:** Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning	**08**
V	**Genetic Algorithms:** an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q Learning.	**08**

Text books:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

GAME PROGRAMMING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**3D GRAPHICS FOR GAME PROGRAMMING :** 3D Transformations, Quaternions, 3D Modeling And Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera And Projections, Culling And Clipping, Character Animation, Physics-Based Simulation, Scene Graphs.	**08**
II	**GAME ENGINE DESIGN:** Game Engine Architecture, Engine Support Systems, Resources And File Systems, Game Loop And Real-Time Simulation, Human Interface Devices, Collision And Rigid Body Dynamics, Game Profiling.	**08**
III	**GAME PROGRAMMING** : Application Layer, Game Logic, Game Views, Managing Memory, Controlling The Main Loop, Loading And Caching Game Data, User Interface Management, Game Event Management.	**08**
IV	**GAMING PLATFORMS AND FRAMEWORKS:** 2D And 3D Game Development Using Flash, DirectX, Java, Python, Game Engines – DX Studio, Unity.	**08**
V	**GAME DEVELOPMENT:** Developing 2D And 3D Interactive Games Using DirectX Or Python – Isometric And Tile Based Games, Puzzle Games, Single Player Games, Multi Player Games.	**08**

Text books:

1. Mike Mc Shaffrfy And David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach To Real-Time Computer Graphics" 2nd Editions, Morgan Kaufmann, 2006.
4. Ernest Adams And Andrew Rollings, "Fundamentals Of Game Design", 2nd Edition Prentice Hall / New Riders, 2009.
5. Eric Lengyel, "Mathematics For 3D Game Programming And Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
6. Jesse Schell, The Art Of Game Design: A Book Of Lenses, 1st Edition, CRC Press, 2008.

IMAGE PROCESSING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**DIGITAL IMAGE FUNDAMENTALS:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	**08**
II	**IMAGE ENHANCEMENT :** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	**08**
III	**IMAGE RESTORATION :** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	**08**
IV	**IMAGE SEGMENTATION:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**08**
V	**IMAGE COMPRESSION AND RECOGNITION:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.	**08**

Text books:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing Pearson, Third Edition, 2010
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.
3. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt,Digital Image Processing John Wiley, New York, 2002
7. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

PARALLEL AND DISTRIBUTED COMPUTING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Scope , issues, applications and challenges of Parallel and Distributed Computing **Parallel Programming Platforms:** Implicit Parallelism: Trends in Microprocessor Architectures, Dichotomy of Parallel Computing Platforms, Physical Organization, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, GPU, co-processing. **Principles of Parallel Algorithm Design:** Decomposition Techniques,Characteristics of Tasks and Interactions,Mapping Techniques for Load Balancing.	**08**
II	**CUDA programming model:** Overview of CUDA, Isolating data to be used by parallelized code, API function to allocate memory on parallel computing device, to transfer data, Concepts of Threads, Blocks, Grids, Developing a kernel function to be executed by individual threads, Execution of kernel function by parallel threads, transferring data back to host processor with API function.	**08**
III	**Analytical Modeling of Parallel Programs:** Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost-Optimal Execution Time	**08**
IV	**Dense Matrix Algorithms:** Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Issues in Sorting on Parallel Computers, Bubble Sort and Variants, Quick Sort, Other Sorting Algorithms **Graph Algorithms:** Minimum Spanning Tree: Prim's Algorithm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths, Transitive Closure, Connected Components, Algorithms for Sparse Graph	**08**
V	**Search Algorithms for Discrete Optimization Problems:** Sequential Search Algorithms, Parallel Depth-First Search, Parallel Best-First Search, Speedup Anomalies in Parallel Search Algorithms	**08**

Text books:

1. A Grama, A Gupra, G Karypis, V Kumar. Introduction to Parallel Computing (2nd ed.). Addison Wesley, 2003.
2. C Lin, L Snyder. Principles of Parallel Programming. USA: Addison-Wesley Publishing Company, 2008.
3. J Jeffers, J Reinders. Intel Xeon Phi Coprocessor High-Performance Programming. Morgan Kaufmann Publishing and Elsevier, 2013.
4. T Mattson, B Sanders, B Massingill. Patterns for Parallel Programming. Addison-Wesley Professional, 2004.

SPEECH AND NATURAL LANGUAGE PROCESSING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION :** Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance **WORD LEVEL ANALYSIS** Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	**08**
II	**SYNTACTIC ANALYSIS** Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.	**08**
III	**SEMANTICS AND PRAGMATICS** Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	**08**
IV	**BASIC CONCEPTS of Speech Processing :** Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter-Bank And LPC Methods.	**08**
V	**SPEECH ANALYSIS**: Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths. **UNIT III : SPEECH MODELING** : Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.	**08**

Text books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language

Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. Lawrence Rabiner And Biing-Hwang Juang, "Fundamentals Of Speech Recognition", Pearson Education, 2003.
4. Daniel Jurafsky And James H Martin, "Speech And Language Processing – An Introduction To Natural Language Processing, Computational Linguistics, And Speech Recognition", Pearson Education, 2002.
5. Frederick Jelinek, "Statistical Methods Of Speech Recognition", MIT Press, 1997.
6. 1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
7. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
8. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
9. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

DEEP LEARNING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	INTRODUCTION : Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates	**08**
II	DEEP NETWORKS : History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning	**08**
III	DIMENTIONALITY REDUCTION 9 Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization	**08**
IV	OPTIMIZATION AND GENERALIZATION : Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience	**08**
V	CASE STUDY AND APPLICATIONS : Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection-Bioinformatics- Face Recognition- Scene Understanding-Gathering Image Captions	**08**

Text books:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.

2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.

3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.

4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

DATA COMPRESSION		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.	**08**
II	The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.	**08**
III	Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.	**08**
IV	Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.	**08**
V	Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.	**08**

Text books:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

2. Elements of Data Compression,Drozdek, Cengage Learning

3. Introduction to Data Compression, Second Edition, Khalid Sayood,The Morgan aufmann Series

4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer

5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	**Proposed Lecture**
I	**Fundamental Concepts:** Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	**08**
II	**Quantum Computation**: Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.	**08**
III	**Quantum Computers:** Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance	**08**
IV	**Quantum Information:** Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	**08**
V	**Quantum Error Correction:** Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource .	**08**

Text books:

1. Micheal A. Nielsen. &Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition, 2002.

2. Eleanor G. Rieffel , Wolfgang H. Polak , "Quantum Computing - A Gentle Introduction" (Scientific and Engineering Computation) Paperback – Import,

3 Oct 2014 3. Computing since Democritus by Scott Aaronson

4. Computer Science: An Introduction by N. DavidMermin 5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. SECOND YEAR

ELECTRONICS ENGINEERING/ ELECTRONICS AND COMMUNICATION ENGINEERING/ ELECTRONICS AND TELECOMMUNICATION ENGINEERING/ ELECTRONICS AND INSTRUMENTATION ENGINEERING/ INSTRUMENTATION AND CONTROL ENGINEERING/ APPLIED ELECTRONICS AND INSTRUMENTATION/ INSTRUMENTATION ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2019-20]

B.Tech. (Electronics & Communication Engg.) **Semester III**

Sr. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
	KOE031-38/ KAS302	Engg. Science Course /Maths IV	3	1	0	30	20	50		100		150	4
1.	KAS301/ KVE301	Technical Communication /Universal Human values	2	1	0	30	20	50		100		150	3
			3	0	0								
2.	KEC301	Electronic Devices	3	1	0	30	20	50		100		150	4
3.	KEC302	Digital System Design	3	1	0	30	20	50		100		150	4
4.	KEC303	Network Analysis and Synthesis	3	0	0	30	20	50		100		150	3
6.	KEC351	Electronics Devices Lab	0	0	2				25		25	50	1
7.	KEC352	Digital System Design Lab	0	0	2				25		25	50	1
8.	KEC353	Network Analysis and Synthesis lab	0	0	2				25		25	50	1
9.	KEC354	Mini Project or Internship Assessment	0	0	2			50				50	1
10.	KNC301 /KNC302	Computer System Security /Python Programming	2	0	0	15	10	25		50			0
11.		MOOCs (Essential for Hons. Degree)											
		TOTAL										**950**	**22**
*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.													

Semester IV

Sr. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1.	KAS402/ KOE041-48	Maths-IV / Engg. Science Course	3	1	0	30	20	50		100		150	4
2.	KVE401/ KAS401	Universal Human Values/ Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
3.	KEC401	Communication Engineering	3	0	0	30	20	50		100		150	3
4.	KEC402	Analog Circuits	3	1	0	30	20	50		100		150	4
5.	KEC403	Signal System	3	1	0	30	20	50		100		150	4
6.	KEC451	Communication Engineering Lab	0	0	2				25		25	50	1
7.	KEC452	Analog Circuits Lab	0	0	2				25		25	50	1
8.	KEC453	Signal System Lab	0	0	2				25		25	50	1
9.	KNC402/ KNC401	Python Programming/ Computer System Security	2	0	0	15	10	25		50			0
10.		MOOCs (Essential for Hons. Degree)											
		TOTAL										**900**	**21**

KEC301	Electronics Devices	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams.	8
II	Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current, drift current, mobility and resistivity, sheet resistance, design of resistors.	8
III	Generation and recombination of carriers, Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models.	8
IV	Avalanche breakdown, Zener diode, Schottky diode, Bipolar Junction Transistor, I-V characteristics, Ebers-Moll model.	8
V	MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.	8

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson, 2014.
2. D. Neamen , D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of Solid State Electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford univ. press, 2011.
6. Muhammad H. Rashid, “Electronic Devices and Circuits,” Cengage publication, 2014.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the principles of semiconductor Physics.
2. Understand and utilize the mathematical models of semiconductor junctions.
3. Understand carrier transport in semiconductors and design resistors.
4. Utilize the mathematical models of MOS transistors for circuits and systems.
5. Analyse and find application of special purpose diodes.

KEC302	Digital System Design	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Logic simplification and combinational logic design: Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, tabulation method.	8
II	MSI devices like comparators, multiplexers, encoder, decoder, driver & multiplexed display, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.	8
III	Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, edge triggered FF, state diagram, state reduction, design of sequential circuits, ripple and synchronous counters, shift registers, finite state machines, design of synchronous FSM, algorithmic state machines charts. Designing synchronous circuits like pulse train generator, pseudo random binary sequence generator, clock generation.	8
IV	Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.	8
V	Digital-to-Analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. analog-to-digital converters (ADC): single slope, dual slope, successive approximation, flash etc. switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	8

Text/Reference Books:

1. R.P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 4th edition, 2009.
2. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.
3. W.H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice," PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
5. A. K. Singh, "Foundation of Digital Electronics & Logic Design," New Age Int. Publishers.
6. Subrata Ghosal, "Digital Electronics," Cengage publication, 2nd edition, 2018

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Design and analyze combinational logic circuits.
2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
3. Design & analyze synchronous sequential logic circuits
4. Analyze various logic families.
5. Design ADC and DAC and implement in amplifier, integrator, etc.

KEC303	Network Analysis and Synthesis	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Node and mesh analysis, matrix approach of network containing voltage & current sources and reactances, source transformation and duality.	8
II	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tallegen's theorem as applied to A.C. circuits.	8
III	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	8
IV	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.	8
V	Transient behaviour, concept of complex frequency, driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and two four port network and interconnections, behaviour of series and parallel resonant circuits, introduction to band pass, low pass, high pass and band reject filters.	8

Text/Reference Books

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyammohan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

KEC351	Electronic Devices Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. **Study of Lab Equipment and Components:** CRO, multimeter, and function generator, power supply- active, passive components and bread board.
2. **P-N Junction diode:** Characteristics of PN junction diode - static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.
5. **Characteristics of Photo diode:** V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.
6. **Characteristics of Solar cell:** V-I characteristics of solar cell, graphical measurement of forward and reverse resistance.
7. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
8. **Characteristic of BJT:** BJT in CE configuration- graphical measurement of h-parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
9. **Field Effect Transistors:** Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Metal Oxide Semiconductor Field Effect Transistors:** Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand working of basic electronics lab equipment.
2. Understand working of PN junction diode and its applications.
3. Understand characteristics of Zener diode.
4. Design a voltage regulator using Zener diode.
5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.

KEC352	Digital System Design Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuits and other components.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Design and analyze combinational logic circuits.
2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
3. Design & analyze synchronous sequential logic circuits.
4. Design & build mini project using digital ICs.

KEC353	Network Analysis and Synthesis Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Verification of Kirchhoff's laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem and Maximum power transfer theorem.
4. Verification of Tallegen's theorem.
5. Measurement of power and power factor in a single phase AC series inductive circuit and study improvement of power factor using capacitor.
6. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
7. Determination of parameters of AC single phase series RLC circuit.
8. To find poles and zeros of immittance function.
9. Design and find cut-off frequency of low pass and high pass filters.
10. Design and find the pass band frequencies of band pass filters.
11. Design and find the stop band frequencies of band reject filters.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics of electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Analyse RLC circuits.
4. Determine the stability of an electrical circuit.
5. Design network filters.

Semester-IV

KEC401	Communication Engineering	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Review of signals and systems, frequency domain representation of signals, principles of amplitude modulation systems- DSB, SSB and VSB modulations.	8
II	Angle modulation, representation of FM and PM signals, spectral characteristics of angle modulated signals.	8
III	Review of probability and random process, Gaussian and white noise characteristics, noise in amplitude modulation systems, noise in frequency modulation systems, pre-emphasis and de-emphasis, threshold effect in angle modulation.	8
IV	Pulse modulation, sampling process, pulse amplitude and pulse code modulation (PCM), differential pulse code modulation. Delta modulation, noise considerations in PCM, time division multiplexing, digital multiplexers.	8
V	Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying.	8

Text/Reference Books:

1. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering," Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering," John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication," Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications',' 4th Edition, McGraw Hill, 2000.
7. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
2. Analyze the behavior of a communication system in presence of noise.
3. Investigate pulsed modulation system and analyze their system performance.
4. Investigate various multiplexing techniques.
5. Analyze different digital modulation schemes and compute the bit error performance.

KEC402	Analog Circuits	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	8
III	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.	8
IV	Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines.	8

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," Mc Graw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.

KEC403	Signal System	3L:1T:0P	4 Credits

Unit	Topics	Lectures
I	Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.	8
II	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response	8
III	Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality , Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.	8
IV	The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis.	8
V	The sampling theorem and its implications- spectra of sampled signals, reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on, aliasing and its effects, relation between continuous and discrete time systems.	8

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International Edition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia) Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, ""Signals and Systems," Wiley India Private Limited, 2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB," TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi, 2001.
10. A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and Stochastic Processes," Cengage publication, 2018.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze different types of signals.
2. Analyze linear shift-invariant (LSI) systems.
3. Represent continuous and discrete systems in time and frequency domain using Fourier series and transform.
4. Analyze discrete time signals in z-domain.
5. Study sampling and reconstruction of a signal.

KEC451	Communication Engineering Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study sampling and reconstruction of pulse amplitude modulation system.
5. To study pulse amplitude modulation.
   a) Using switching method
   b) By sample and hold circuit
6. To demodulate the obtained PAM signal by 2nd order LPF.
7. To study pulse width modulation and pulse position modulation.
8. To study pulse code modulation and demodulation technique.
9. To study delta modulation and demodulation technique.
10. To construct a square wave with the help of fundamental frequency and its harmonic component.
11. Study of amplitude shift keying modulator and demodulator.
12. Study of frequency shift keying modulator and demodulator.
13. Study of phase shift keying modulator and demodulator.
14. Study of single bit error detection and correction using hamming code.
15. Study of quadrature phase shift keying modulator and demodulator.
16. To simulate differential phase shift keying technique using MATLAB software.
17. To simulate M-ary Phase shift keying technique using MATLAB software (8PSK, 16PSK) and perform BER calculations.
18. Design a front end BPSK modulator and demodulator.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their modulation factor and power.
2. Study pulse amplitude modulation.
3. Analyze different digital modulation schemes and can compute the bit error performance.
4. Study and simulate the Phase shift keying.
5. Design a front end BPSK modulator and demodulator.

KEC452	Analog Circuit Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
3. Study of Multi-stage amplifiers: Frequency response of single stage and multistage amplifiers.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
5. Measurement of Op-Amp parameters: Common mode gain, differential mode gain, CMRR, slew rate.
6. Applications of Op-Amp: Op-Amp as summing amplifier, difference amplifier, integrator and differentiator.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.),
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.
13. Design and study of Digital to Analog Converter.

Course Outcome

At the end of this course students will demonstrate the ability to:

1. Understand the characteristics of transistors.
2. Design and analyze various configurations of amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design ADC and DAC.

KEC453	Signal System Lab	0L:0T:2P	1 Credits

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two and three dimensional plots.
    b. Write a MATLAB program to plot the following continuous time and discrete time signals.
        i. Step Function
        ii. Impulse Function
        iii. Exponential Function
        iv. Ramp Function
        v. Sine Function
3. Time and Amplitude transformations
   Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
   Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier series as a function of time.
    c. To Sum the first 50 terms and plot the Fourier series as a function of time.
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier transform of a given signal.
    b. Calculate and plot Z-transform of a given signal.
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation.
    b. Compute and plot the response of a given system to a given input.
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function.
10. Frequency response of a system
    Write a MATLAB program to plot magnitude and phase response of a given system.

11. Checking linearity/non-linearity of a system using SIMULINK

a. Build a system that amplifies a sine wave by a factor of two.
b. Test the linearity of this system using SIMULINK.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the basics operation of MATLAB.
2. Analysis the time domain and frequency domain signals.
3. Implement the concept of Fourier series and Fourier transforms.
4. Find the stability of system using pole-zero diagrams and bode diagram.
5. Design frequency response of the system.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS
FOR

B. TECH. III YEAR

ELECTRONICS ENGINEERING/ ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS & TELECOMMUNICATION ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]

EVALUATION SCHEME

B.TECH. ELECTRONICS ENGINEERING, B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING, B.TECH. ELECTRONICS & TELECOMMUNICATION ENGINEERING

YEAR 3rd/ SEMESTER V

Sr. No.	Sub Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS501	Managerial Economics	3--0--0	70	20	10	100	3
2	RAS502 /RUC501	Sociology/Cyber Security	3--0--0	70	20	10	100	3
3	REC501A	Integrated Circuits	3--0--0	70	20	10	100	3
4	REC502	Principles of Communication	3--1--0	70	20	10	100	4
5	REC503	Digital Signal Processing	3--0--0	70	20	10	100	3
6	REC051-055	Deptt. Elective Course 1	3--1--0	70	20	10	100	4
7	REC551	Integrated Circuits Lab	0--0--2	50		50	100	1
8	REC552	Communication Lab – I	0--0--2	50		50	100	1
9	REC553	Digital Signal Processing Lab	0--0--2	50		50	100	1
10	REC554	CAD of Electronics Lab-I	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–1

1. **REC051 - Antenna & wave propagation**
2. **REC052 - Computer Architecture and Organization**
3. **REC053- Real Time Systems**
4. **REC054- Artificial Neural Networks**
5. **REC055- Advance Semiconductor devices**

EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering

YEAR 3rd/ SEMESTER VI

Sr. No	Sub Code	Subject Name	L-T-P	Th/LAB Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS601	Industrial Management	3--0--0	70	20	10	100	3
2	RAS602 / RUC601	Sociology /Cyber Security	3--0--0	70	20	10	100	3
3	RIC603	Control System I	3--0--0	70	20	10	100	3
4	REC601	Microwave Engineering	3--1--0	70	20	10	100	4
5	REC602	Digital Communication	3--0--0	70	20	10	100	3
6	REC061 - 065	Deptt. Elective Course 2	3--1--0	70	20	10	100	4
7	REC-651	Microwave Engg Lab	0--0--2	50		50	100	1
8	REC-652	Communication Lab- II	0--0--2	50		50	100	1
9	RIC-653	Control System Lab-I	0--0--2	50		50	100	1
10	RIC-651	Microcontrollers For Embedded Systems Lab	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–2

1. **REC061 - Industrial Electronics**
2. **REC062 - Microcontroller for Embedded Systems**
3. **REC063 - Analog Signal Processing**
4. **REC064 - Advance Digital Design Using Verilog**
5. **REC065- RADAR Engineering**

REC501	INTEGRATED CIRCUITS	
Unit	Topic	Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors. **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design- An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, AnalogMultipliersand their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters Integrated Circuit Timer:** The 555 Circuit, Implementing a Mono stable Multi-vibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Book:

1. Sedra and Smith, "Microelectronic Circuits", 6th Edition, Oxford University Press.
2. Michael Jacob, "Applications and Design with Analog Integrated Circuits", PHI, 2nd Edition.
3. A. K. Maini, Analog Circuits, Khanna Publishing House, Delhi.

Reference Books:

1. Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Edition, Tata McGraw Hill.
2. BehzadRazavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley.
3. Mark N. Horenstein, "Microelectronic Circuits and Devices", PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

REC502	PRINCIPLES OF COMMUNICATION	
Unit	Topic	Lectures
I	Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.	7
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy	9
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill.
2. Rishabh Anand, Communication Systems, Khanna Publishing House, Delhi

Reference Books:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

REC503	DIGITAL SIGNAL PROCESSING	
Unit	Topics	Lectures
I	Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization, FIR Filter Realization: Direct & Cascade, FIR Linear Phase Realization.	8
II	Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and ChebyshevFilters, Frequency Transformations.	8
III	Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window, Finite Word length effects in digital filters.	8
IV	DFT & FFT: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution using Circular Convolution, Decimation in Time (DIT) Algorithm, Decimation in Frequency (DIF) Algorithm.	8
V	Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion: Single and Multistage, SubbandCoding of Speech signals, Quadrature mirror filters.	8

Text Book:

1. Johnny R. Johnson, .Digital Signal Processing., PHI Learning Pvt Ltd., 2009.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, .Digital Signal Processing. Pearson Education.
2. Oppenheim & Schafer, . Digital Signal Processing. PHI

LABORATORY

REC551 INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of thecircuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for-
    - **a)** Low pass filter of specified cut off frequency.
    - **b)** High pass filter of specified frequency.
    - **c)** Band pass filter with unit gain of specified pass band
    - **d)** Design a notch filter to eliminate 50Hz power line frequency.
4. Wien bridge oscillator using operational amplifier.
5. Astable and mono-stable multivibrators using IC 555.
6. Design the following amplifiers:
    - **a)** A unity gain amplifier.
    - **b)** A non-inverting amplifier with a gain of "A".
    - **c)** An inverting amplifier with a gain of "A".
    - **d)** Log and antilog amplifiers.
    - **e)** Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency „f". Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC.

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

REC552 **COMMUNICATION LAB-I**

List of Experiments

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation.
    a) using switching method
    b) by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To study Pulse code modulation and demodulation technique.
11. To study Delta modulation and demodulation technique.
12. Design and implement an FM radio receiver in 88-108 MHz

REC553 **DIGITAL SIGNAL PROCESSING LAB**

List of Experiments

1. To study about DSP Processors and architecture of TMS320C6713 DSP processor.
2. Introduction to MATLAB and Code Composer Studio or its equivalent open source software.
   OR
   Introduction to Scilab Open Source Software (Using Spoken Tutorial MOOCs)
3. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
4. To study matrix multiplication using code composer studio.
5. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.
6. To implement FFT algorithm.
7. Verify Blackman and Hamming windowing techniques.
8. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
9. Verify Circular Convolution using code composer studio.
10. Verify Linear convolution of two sequence using code composer studio.
11. To implement Tone Generation.
12. To implement floating point arithmetic.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

REC554CAD OF ELECTRONICS LAB- I

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient &DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.
6. Design and Simulation of a Differential Amplifier (with Resistive Load, Current Source Biasing)
7. Analysis of frequency response of Common Source amplifiers.
8. Analysis of frequency response of Source Follower amplifiers.
9. Analysis of frequency response of Cascode amplifiers.
10. Analysis of frequency response of Differential amplifiers.

DEPARTMENTAL ELECTIVE COURSE 1

REC051	ANTENNA AND WAVE PROPAGATION	
Unit	Topic	Lectures
I	Antennas Basics:Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	5
II	Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non-uniform Amplitude Distributions. General Considerations.	8
III	Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	8
IV	The Loop Antenna:Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. Reflector Antennas: Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	9
V	Ground Wave Propagation: Plane Earth Reflection, Space Wave and Surface Wave. Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. Sky wave Propagation**:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	10

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, “Antennas and Wave Propagation”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. A. R. Harish, M. Sachidananda, “Antennas and Wave Propogation”, Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
3. R.L. Yadava, Electromagnetic Waves, Khanna Publishing House, Delhi.
4. A. Das, Sisir K. Das, “Microwave Engineering”, Tata McGraw Hill.

REC052	Computer Architecture and Organization	
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8
III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.
4. I. Singh, Computer Organisation and Architecture, Khanna Publishing House, Delhi

REC053	REAL TIME SYSTEMS	
Units	**Topic**	**Lectures**
I	**Introduction to Real Time** System Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8
II	**Embedded Hardware for Real Time** System Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware** – On chip Peripherals and Communication protocols Role of peripherals for Real time systems, On-Chip peripherals& hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI &UART. Introduction to the CCS IDE: its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. Programming: demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, "DSP based Electromechanical Motion Control" CRC Press Publication.
4. Jean J Labrosse, "Embedded System Design blocks", CMP books Publication
5. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication

REC054	Artificial Neural Network	
Unit	**Topic**	**Lectures**
I	**Introduction to ANN:** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks** - History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8
IV	**a)Feedforward neural networks** -- Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran ,VijayalakshmiPari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

REC055	ADVANCE SEMICONDUCTOR DEVICES	
Unit	Topics	Lectures
I	Physics of Semiconductors, P-N Junction Diode and BJT: Introduction, Crystal Structure, Phonon, Optical, and Thermal Properties,*p-n* Junctions –Junction Breakdown, Transient Behavior and Noise Terminal Functions.BJT:Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor.	8
II	MOSFET, Hetero-Junctions and Basics of Nanostructures: MOSFET: Basic Device Characteristics, Nonuniform Doping and Buried Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Single Electron Transistor, JFETs. Hetero-junctions:Metal-Semiconductor Contacts, Metal-Insulator-Semiconductor Capacitors. MESFETs and MODFETs. Nanostructures: Basic Equations and Examples.	8
III	TUNNEL Devices and IMPATT Diodes: TUNNEL DEVICES:Tunnel Diode, Related Tunnel Devices, Resonant Tunneling Diode. IMPATT Diodes: Static Characteristics, Dynamic Characteristics, Power and Efficiency Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode	8
IV	Power devices, Photonic devices:Transferred-Electron and Real-Space-Transfer Devices Thyristors, Power Devices. Photonic Devices and Sensors: Radiative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers	8
V	Photodetectors, Solar Cells and Sensors:Photodiodes, Avalanche Photodiode and Phototransistor, Charge-Coupled Device (CCD), Metal- Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell Sensors: Thermal Sensor, Mechanical Sensors, Magnetic Sensors and Chemical Sensors	8

Text Book:

1. S. M. Sze, Kwok K. NG, “Physics of Semiconductor Devices”, 3rd Edition, Wiley Publication

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics Of Semiconductor Devices", Kluwer Academic Publishers
2. B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.
3. SupriyoDatta, “Quantum Transport Atom to Transistor”, Cambridge University Press, 2005
4. A.K. Maini, All in One Electronics Simplified, Khanna Publishing House, Delhi

RIC603 CONTROL SYSTEM-I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems, Analogous Systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability, Eigen Value and Eigen Vector, Diagonalization.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci.	8
V	Frequency Domain Analysis: Mr (resonant peak) and ωr (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Polar Plot, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with the Bode plot.	8

Text Book:

1. B.C. Kuo&FaridGolnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. I. J. Nagrath& M. Gopal, "Control System Engineering", New Age International Publishers
2. A. Ambikapathy, Control Systems, Khanna Publishing House, Delhi.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rdEdition, Tata McGraw Hill, Special Indian Edition 2010.
3. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.

REC601	MICROWAVE ENGINEERING	
Unit	**Topics**	**Lectures**
I	**Rectangular & circular waveguides:Introduction to microwave communication and EM spectrum**, Rectangular wave guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular waveguides: TE, TM modes. Wave velocities, Microstrip transmission line (TL), Coupled TL, Strip TL, Coupled strip line, Coplanar TL, Microwave cavities	11
II	**Passive microwave devices:** Scattering matrix, Passive microwave devices: Microwave hybrid circuits, Terminations, Attenuators, Phase Shifters, Directional couplers: Two-hole directional couplers, S- Matrix of a directional coupler, Hybrid couplers, Microwave propagation in ferrites, Faraday rotation, Isolators, Circulators. S-parameter analysis of all components.	10
III	**Microwave tubes :**Microwave tubes: Limitations of conventional active devices at microwave frequency, Two cavity Klystron, Reflex Klystron, Magnetron, Traveling wave tube, Backward wave oscillators, Gyro Devices: Their schematic, Principle of operation, Performance characteristic and their applications.	7
IV	**Solid state amplifiers and oscillators:** Transferred electron devices: Gunn-effect diodes & modes of operation. Avalanche transit – time devices: IMPATT diode, TRAPPAT diode, BARITT diode.	5
V	**Microwave Measurements:** VSWR meter, Frequency meter, Spectrum analyser, Network analyser,Tunable detector, Slotted line carriage, Power meter, Microwave power measurement, Insertion loss and attenuation measurement, VSWR measurement, Return loss measurement by a reflectometer, Frequency measurement, measurement of cavity Q, Dielectric constant measurement of a solid, EM radiation & measurement.	7

Text Books:

1. G. S. Raghuvanshi, Microwave Engineering; Cengage
2. S.Y. Liao, Microwave Devices & Circuits; PHI 3rd Ed.

Reference Books:

1. A Das and S.K. Das, Microwave Engineering; McGraw Hill Education
2. S. Vasuki, D Margaret Helena, R Rajeswari, Microwave Engineering; MHE
3. M.I. Skolnik, Introduction to Radar Engineering ; TMH
4. Om P. Gandhi, Microwave Engineering and Applications; Pergamon Press

REC602	DIGITAL COMMUNICATION	
Unit	**Topic**	**Lectures**
I	Principles of digital data transmission: Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system. Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation.	08
II	Fundamentals of probability theory & random process : Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes Power spectral density, Multiple random Processes.	08
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers	08
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications Introduction to information theory: Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel. Capacity of a discrete and Continuous Memory less channel.	08
V	Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability Linear block codes: encoding and syndrome decoding. Cyclic codes: encoder and decoder for systematic cyclic codes. Convolution codes, code tree and Trellis diagram, Viterbi and sequential decoding, Burst error correction, Turbo codes.	08

Text Book:

1. B.P. Lathi, “Modern Digital and Analog communication Systems”, 4th Edition, Oxford University Press, 2010.
2. RishabhAnand, Communication Systems, Khanna Publishing House, Delhi.

Reference Books:

1. H. Taub, D L Schilling, GautamSaha, “Principles of Communication”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. John G. Proakis, “Digital Communications”, 4th Edition, McGraw-Hill International.
3. Simon Haykin, “Communication Systems”, 4th Edition, Wiley India.
4. H P HSU & D Mitra, “Analog and Digital Communications”, 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

LABORATORY

REC651 **MICROWAVE ENGINEERING LAB**

List of Experiments

1. To study microwave test bench.
2. To study the characteristics of reflex klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE_{01} mode.
4. To study measurement of reflection coefficient and standing wave ratio using double minima method.
5. To study V-I characteristic of Gunn diode.
6. To measure an unknown impedance with Smith chart.
7. Study of Circulator/Isolator.
8. Study of Attenuator (Fixed and Variable type).
9. To study simple dipole $\lambda/2$ antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
10. To study folded dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
11. To study $\lambda/2$ phase array end-fire antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
12. To study broadside array antenna and to calculate beam-width, front / back ratio, and gain of the antenna.

REC652 **COMMUNICATION LAB – II**

List of Experiments

1. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component
2. Study of pulse data coding & decoding techniques for NRZ and RZ formats.
3. Study of Manchester coding and Decoding.
4. Study of Amplitude shift keying modulator and demodulator.
5. Study of Frequency shift keying modulator and demodulator.
6. Study of Phase shift keying modulator and demodulator.
7. Study of single bit error detection and correction using Hamming code.
8. Study of Quadrature Phase shift keying modulator and demodulator.
9. To simulate Differential Phase shift keying technique using MATLAB software.
10. To simulate M-ary Phase shift keying technique using MATLAB software (example8PSK, 16PSK) and perform BER calculations.
11. To simulate convolutional coding using MATLAB software.
12. Design a front end BPSK modulator and demodulator.

RIC653CONTROL SYSTEM LAB-I

List of Experiments:

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolboxor its equivalent open source freeware software like Scilabusing Spoken Tutorial MOOCs.
2. Determine transpose, inverse values of given matrix.
3. Plot the pole-zero configuration in s-plane for the given transfer function.
4. Determine the transfer function for given closed loop system in block diagram representation.
5. Plot unit step response of given transfer function and find delay time, rise time, peak time and peak overshoot.
6. Determine the time response of the given system subjected to any arbitrary input.
7. Plot root locus of given transfer function, locate closed loop poles for different values of k. Also find out Wd and Wnat for a given root.
8. Create the state space model of a linear continuous system.
9. Determine the State Space representation of the given transfer function.
10. Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.
11. Determine the steady state errors of a given transfer function.
12. Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

RIC651 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

DEPARTMENTAL ELECTIVE COURSE 2

REC061	INDUSTRIAL ELECTRONICS	
Unit	Topics	Lectures
I	**Power Semiconductor Devices**: Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	8
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters**: Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, stepup/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. Control of D.C. Drives: Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	8
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	8
V	Protection of device and circuits: Introduction, Cooling and heat sinks, Thermal Modeling of Power Switching devices, Snubber Circuits, Reverse Recovery Transients, Supply- and Load- side Transients, Voltage Protection, Current Protections, Electromagnetic Interference.	8

Text Books:

1. M. H. Rashid, “Power Electronics”, 3rd Edition, Pearson Education.
2. M. D. Singh & K. Khanchandani, “Power Electronics”, Tata McGraw Hill.

Reference Books:

1. V.R. Moorthy, “Power Electronics: Devices, Circuits and Industrial Applications”, Oxford University Press,2007.
2. M.S. JamilAsghar, “Power Electronics”,PHI.
3. Chakrabarti&Rai, “Fundamentals of Power Electronics &Drives”DhanpatRai& Sons.
4. Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics:Converters, Applications and Design”, Wiley India.
5. S.N.Singh, “A Text Book of Power Electronics”,DhanpatRai& Sons.

REC602 MICROCONTROLLER FOR EMBEDDED SYSTEMS		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlayRolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

REC063	ANALOG SIGNAL PROCESSING	
Unit	Topics	Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. Second-order filter realization, filter design parameters (Q and ω_0), frequency response, Three op-amp biquad, effect of finite gain of op-amp over filters, Sallen-Key biquad.	10
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications, comparison of Maximally flat and Equal ripple responses.	8
III	Delay equalization: equalization procedures, equalization with first-order and second order modules, strategies for equalization design. Definition of Bode sensitivity.	7
IV	The General Impedance Convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8
V	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, Gyrator, First and second order filters, Higher order filters	**7**

Text Book:

1. R. Schaumann and M.E. Valkenberg,"Design of Analog Circuits", Oxford University Press

REC064	ADVANCED DIGITAL DESIGN USING VERILOG	
Unit	**Topic**	**Lectures**
I	ntroduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Introduction to Verilog, Behavioral and Structural specification of logic circuits, Boolean function implementation using Verilog, Timing Analysis, Hazard Detection and Elimination	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous StateMachines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi-levelminimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis incombinational and sequential systems, Path Sensitization method, Boolean DifferenceMethod, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures,Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Richard F. Tinder, "Engineering Digital Design", Academic Press.
2. Parag K. Lala, "Digital system Design Using PLDs", PHI India Ltd.
3. Stephen Brown and ZvonkoVranesiv, "Fundamental of Digital Logic with Verilog Design", Tata McGraw Hill.

Reference Books:

1. John Williams, "Digital VLSI Design with Verilog", Springer Publication.
2. Eugene Fabricius, "Modern Digital Design and Switching Theory", CRC Press.
3. Samuel C. Lee, "Digital Circuit and Logic Design", PHI India Ltd.
4. Alexander Miczo, "Digital Logic Testing and Simulation",WileyInterscience.

REC065RADAR ENGINEERING

Unit	Topics	Lectures
I	**Introduction to Radar:** Basic radar, The simple form of radar equation, Radar block diagram, Radar frequencies, Applications to radar.	5
II	**Radar Equation:** Introduction, Detection of signal in noise, Receiver noise and the signal to noise ratio, Probability density functions, Probabilities of detection and false alarm, Integration of Radar pluses, Radar cross section of targets, Radar cross section fluctuations, Transmitter power, Pulse repetition frequency, antenna parameters, system losses, Other Radar equation considerations.	9
III	**MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI Radar, Delay-Line cancelers, Staggered pulse repetition frequencies, Doppler filter banks, Digital MTI processing, Moving target detector, Limitation of MTI performance, MTI from a moving platform, Pulse Doppler Radar, CW Radar.	9
IV	**Tracking Radar:** Tracking with Radar, Mono-pulse tracking, Conical scan and sequential lobbing, Limitation to tracking accuracy, Low-angle tracking, Tracking in range, Comparison of trackers, Automatic tracking with Surveillance Radar (ADT)	8
V	**Information from Radar signals:** Basic Radar measurements, Ambiguity diagram, Pulse compression, Target recognition. **Radar Clutter:** Land clutter, Sea clutter, Weather clutter and detection of targets in clutter.	9

Text Book:

1. Merrill I. Skolnik“ Introduction to Radar Systems” Third Edition.

Reference Book:

1 J.C. Toomay , Paul J. Hannen “ Principles of Radar” Third Edition.
2 GottapuSasibhusanaRao, “Microwave and Radar Engineering, Pearson.
3 Bernard Davis,George Kennedy, Electronic Communication Systems, Tata McGraw-Hill Education Pvt. Ltd.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, "Computer Networks" Pearson.
5. Ajit Pal, "Data Communication and Computer Networks", PHI
6. Dimitri Bertsekas, Robert G. Gallager, "Data Networks", Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins," Carrier-Grade VoIP", McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, "IP Telephony – Deploying Voice Over-IP Protocols", John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

NEC 041 ELECTRONIC SWITCHING		3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, "Telecommunication Switching Systems and Networks", PHI.
2. J.E. Flood, "Telecommunication Switching, Traffic and Networks", Pearson Education.
3. John C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER

AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.1 This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of

relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,
for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	Activity
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : **(Introduction to Programming)** **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : **(Arithmetic expressions & Conditional Branching)** **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : **(Loops & Functions)** **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : **(Arrays & Basic Algorithms)** **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :**(Pointer& File Handling)** **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%----------Print 'A'

80-90%----------Print 'B'

60-80%----------Print 'C'

Below 60%----------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.

2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.

3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH 2nd YEAR
MECHANICAL ENGINEERING

On

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

B.Tech. (Mechanical Engineering)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ KAS302	Engg. Science Course/Maths IV	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE301	Technical Communication/Universal Human Values	2 3	1 0	0 0	30	20	50		100		150	3
3	KME301	Thermodynamics	3	1	0	30	20	50		100		150	4
4	KME302	Fluid Mechanics & Fluid Machines	3	1	0	30	20	50		100		150	4
5	KME303	Materials Engineering	3	0	0	30	20	50		100		150	3
6	KME351	Fluid Mechanics Lab	0	0	2				25		25	50	1
7	KME352	Material Testing Lab	0	0	2				25		25	50	1
8	KME353	Computer Aided Machine Drawing-I Lab	0	0	2				25		25	50	1
9	KME354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										**950**	**22**

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/Technical Communication	3 2	0 1	0 0	30	20	50		100		150	3
3	KME401	Applied Thermodynamics	3	0	0	30	20	50		100		150	3
4	KME402	Engineering Mechanics	3	1	0	30	20	50		100		150	4
5	KME403	Manufacturing Processes	3	1	0	30	20	50		100		150	4
6	KME451	Applied Thermodynamics Lab	0	0	2				25		25	50	1
7	KME452	Manufacturing Processes Lab	0	0	2				25		25	50	1
8	KME453	Computer Aided Machine Drawing-II Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming / Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										**900**	**21**

SEMESTER-III

THERMODYNAMICS

L-T-P
3-1-0

Objectives:

- To learn about work and heat interactions, and balance of energy between system andits surroundings.
- To learn about application of I law to various energy conversion devices.
- To evaluate the changes in properties of substances in various processes.
- To understand the difference between high grade and low-grade energies and II lawlimitations on energy conversion.

UNIT I

Review of Fundamental Concepts and Definitions:

Introduction- Basic Concepts: System, ControlVolume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopicviewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Property of mixture of gases, electrical, magnetic,gravitational, spring and shaft work.

Zeroth law of thermodynamics: Concept of Temperature and its' measurement, Temperature scales.

First law of thermodynamics:

First Law for Flow Processes **-** Derivation of general energy equation for a control volume;Steady state steady flow processes including throttling; Examples of steady flow devices;Unsteady processes; examples of steady and unsteady I law applications for system andcontrol volume. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc.

UNIT II

Second law of thermodynamics:

Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy: Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility:

Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Thermodynamic relations:

Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle:
Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Moller chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.
Air-water vapour mixture and Psychrometry: Psychometric terms and their definitions, Psychometric chart, Different Psychometric processes and their representation on Psychometric chart.

UNIT V
Refrigeration Cycles:
Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration.Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system.

Course Outcomes:
- After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
- Students can evaluate changes in thermodynamic properties of substances.
- The students will be able to evaluate the performance of energy conversion devices.
- The students will be able to differentiate between high grade and low-grade energies.

Books and References:
1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA.
2. Thermodynamics for Engineers by Kroos& Potter, Cengage Learning.
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.
6. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
7. Engineering Thermodynamics by Dhar, Elsevier.
8. Engineering Thermodynamics by Onkar Singh, New Age International.
9. Engineering Thermodynamics by CP Arora.
10. Engineering Thermodynamics by Rogers, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Engineering Thermodynamics by Mishra, Cengage Learning.
13. Refrigeration and Air Conditioning by C P Arora, MCGRAW HILL INDIA.

FLUID MECHANICS AND FLUID MACHINES

L-T-P
3-1-0

Objectives:

- To learn about the application of mass and momentum conservation laws for fluid flows.
- To understand the importance of dimensional analysis.
- To obtain the velocity and pressure variations in various types of simple flows.
- To analyze the flow in water pumps and turbines.

UNIT-I

Definition of fluid, Newton's law of viscosity, Units and dimensions-Properties of fluids,mass density, specific volume, specific gravity, viscosity, compressibility and surfacetension, Incompressible flow, Bernoulli's equation and its applications - Pitot tube, orifice meter, venturi meter and bend meter, notches and weirs, momentum equation and its application to pipe bends.

UNIT-II

Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two- and three-dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Buckingham's Pi theorem, important dimensionless numbers and their significance.

UNIT-III

Equation of motion for laminar flow through pipes, turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sublayer, separation and its control, Drag and lift, drag on a sphere, a two-dimensional cylinder, and an aerofoil, Magnus effect.

UNIT-IV

Introduction to hydrodynamic thrust of jet on a fixed and moving surface, Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel.

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

UNIT-V

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

Course Outcomes:

- Upon completion of this course, students will be able to mathematically analyze simple flow situations.
- They will be able to evaluate the performance of pumps and turbines.

Books and References:

1. Introduction to fluid mechanics and Fluid machines by S.K Som, Gautam Biswas, S Chakraborty.
2. Fluid mechanics and machines by R.K Bansal.
3. F. M. White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008.
4. Fluid Mechanics and Its Applications byV.K.Gupta et.al.
5. Fluid Mechanics byYunusCengel.
6. Batchelor, G. K. (1999). Introduction to fluid dynamics. New Delhi, India: Cambridge University Press.
7. Acheson, D. J. (1990). Elementary fluid dynamics. New York, USA: Oxford UniversityPress.
8. R.W. Fox, A.T. McDonald and P.J. Pritchard, Introduction to Fluid Mechanics, 6th Ed., John Wiley, 2004.

MATERIALS ENGINEERING

L-T-P
3-0-0

Objectives:

- Understanding of the correlation between the internal structure of materials, theirmechanical properties and various methods to quantify their mechanical integrity andfailure criteria.
- To provide a detailed interpretation of equilibrium phase diagrams.
- Learning about different phases and heat treatment methods to tailor the properties of Fe-Calloys.

UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids:Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slipsystems, critically resolved shear stress.

Mechanical Property measurement: Tensile, compression and torsion tests; Young'smodulus, relations between true and engineering stress-strain curves, generalized Hooke'slaw, yielding and yield strength, ductility, resilience, toughness and elastic recovery;Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT-II

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximumnormal stress, Mohr-Coulomb and Modified Mohr-Coulomb; Fracture mechanics:Introduction to Stress-intensity factor approach and Griffith criterion. Fatigue failure: Highcycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of meanstress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT).

UNIT-III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binaryphase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructural aspects ofledeburite, austenite, ferrite and cementite, cast iron.

UNIT-IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermaltransformation diagrams for Fe-C alloys and microstructure development. Continuouscooling curves and interpretation of final microstructures and properties-austempering,martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame andinduction hardening, vacuum and plasma hardening.

UNIT-V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons;grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze andcupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titaniumalloys.

Course Outcomes:

- Student will be able to identify crystal structures for various materials and understand thedefects in such structures.
- Understand how to tailor material properties of ferrous and non-ferrous alloys.
- How to quantify mechanical integrity and failure in materials.

Books and References:

1. W. D. Callister, 2006, “Materials Science and Engineering-An Introduction”, 6th Edition, Wiley India.
2. Kenneth G. Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
3. V. Raghavan, “Material Science and Engineering’, Prentice Hall of India Private Limited, 1999.
4. Mechanics of materials by James M.Gere.
5. Introduction to engineering materials by B.K. Agarwal.
6. Physical metallurgy and advanced materials by R.E. Smallman.
7. Engineering mechanics of composite materials by Isaac M. Daniel.
8. U. C. Jindal, “Engineering Materials and Metallurgy”, Pearson, 2011.

FLUID MECHANICS LAB

L-T-P
0-0-2

Objectives:

- To understand the principles and performance characteristics of flow and thermal devices.
- To know about the measurement of the fluid properties.

List of Experiments:(At least 8 of the following)

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturi meter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoulli's Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

Course Outcomes:
The students who have undergone the course will be able to measure various properties offluids and characterize the performance of fluid/thermal machinery.

MATERIAL TESTING LAB

L-T-P
0-0-2

Objectives:

- To understand the principles and performance characteristics different materials.
- To know about material properties.

List of Experiments: (At least 8 of the following)

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

Course Outcomes:

The students who have undergone the course will be able to measure various properties of materials.

COMPUTER AIDED MACHINE DRAWING-I LAB

L-T-P
0-0-2

Objectives:
To provide an overview of how computers can be utilized in mechanical component design.

UNIT-I
Introduction (1 drawing sheets)
Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.
Orthographic Projections (3 drawing sheets)
Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

UNIT-II
Fasteners (2 drawing sheets)
Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

UNIT-III
Riveted joints (1 drawing sheet)
Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.
Free hand sketching (1 drawing sheet**)**
Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

UNIT-IV
Assembly drawing (2 drawing sheets)
Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, Plummer block, footstep bearing, bracket etc.

UNIT-V
Computer aided drafting (1 drawing**)**
Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts.

Course Outcomes:
Upon completion of this course, the students can use computer and CAD software formodelling mechanical components.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI.
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House.
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson.
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age.
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill.
6. Engineering Drawing, Pathak, Wiley.
7. Textbook of Machine Drawing, K C John, PHI.
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY

SEMESTER-IV

APPLIED THERMODYNAMICS

L-T-P
3-0-0

Objectives:

- To learn about of I law for reacting systems and heating value of fuels.
- To learn about gas and vapor cycles and their first law and second law efficiencies.
- To understand about the properties of dry and wet air and the principles of psychrometry.
- To learn about gas dynamics of air flow and steam through nozzles.
- To learn the about reciprocating compressors with and without intercooling.
- To analyze the performance of steam turbines.

UNIT I

Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First lawanalysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flametemperature- Chemical equilibrium and equilibrium composition calculations using freeenergy.
Introduction and Otto, Diesel and Dual cycles.

UNIT II

Vapour Power cycles:
Vapor power cycles Rankine cycle with superheat, reheat and regeneration, exergy analysis. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.
Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.
Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.
Steam Turbines: Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines andtheir processes, Principle of rocket propulsion, Introduction to Rocket Engine.
Reciprocating compressors, staging of reciprocating compressors, optimal stage pressureratio, effect of intercooling, minimum work for multistage reciprocating compressors.

Course Outcomes:

- After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles.
- They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.
- They will be able to understand phenomena occurring in high speed compressible flows.

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, mcgraw hill india.
2. Applied thermodynamics by Onkar Singh, New Age International.
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education.
4. Applied Thermodynamics by Venkanna And Swati, PHI.
5. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
6. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
7. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
8. Theory of Stream Turbine by WJ Kearton.

ENGINEERING MECHANICS

L-T-P
3-1-0

Objectives:
To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT-I:
Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distribution of force systems, free body diagrams, equilibrium and equations of equilibrium.
Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.

UNIT-II:
Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.
Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.

UNIT-III:
Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.

UNIT-IV:
Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.
Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.

UNIT-V:
Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy.
Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections.
Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.

Course Outcomes:
After completing this course, the students should be able to understand the various effect of force and motion on the engineering design structures.

Books and References:
1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).

2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010).

3. A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications.

4. Engineering Mechanics, R.S. Khurmi, S.Chand Publishing.

5. Meriam J.L. and Kraige L.G., “Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons (1993).

6. Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3 rd Edition, Vikas Publishing House Pvt. Ltd., (2005).

7. Bhavikatti, S.S and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, (1998).

8. Engineering mechanics by Irving H. Shames, Prentice-Hall.

MANUFACTURING PROCESSES

L-T-P
3-1-0

Objectives:
To motivate and challenge students to understand and develop an appreciation of theprocesses in correlation with material properties which change the shape, size and form of theraw materials into the desirable product by conventional or unconventional manufacturingmethods.

UNIT-I
Conventional Manufacturing processes:
Casting and moulding: Metal casting processes and equipment, Heat transfer andsolidification, shrinkage, riser design, casting defects and residual stresses.Introduction to bulk and sheet metal forming, plastic deformation and yield criteria;fundamentals of hot and cold working processes; load estimation for bulk forming (forging,rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principlesof powder metallurgy.

UNIT-II
Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components:Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, cutting tool materials, cutting fluids, Coating; Turning, Drilling, Milling and finishing processes,Introduction to CNC machining.Additive manufacturing: Rapid prototyping and rapid toolingJoining/fastening processes: Physics of welding, brazing and soldering;design considerationsin welding,Solid and liquid state joining processes;Adhesive bonding.

UNIT-III
Grinding & Super finishing:
Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Centreless grinding.
Super finishing: Honing, lapping and polishing.

UNIT-IV
Metal Joining (Welding):
Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Weld decay in HAZ.

UNIT-V
Unconventional Machining Processes:
Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, UltrasonicMachining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish,tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining(ECM), etchant &maskant, process parameters, MRR and surface finish.Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron BeamMachining.

Course Outcomes:
Upon completion of this course, students will be able to understand the different conventionaland unconventional manufacturing methods employed for making different products.

Books and References:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black &Kohser, Materials and Processes in Manufacturing.

APPLIED THERMODYNAMICS LAB

L-T-P
0-0-2

Objectives:
To understand the principles and performance of various boilers and engines.

List of Experiments: (At least 8 of the following)

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.
14. Study of Gas Turbine Model.

Course Outcomes:
The student who have undergone the course will be able to identify various properties of system.

MANUFACTURING PROCESS LAB

L-T-P
0-0-2

Objectives:
To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.

List of Experiments: (At least 8 of the following along-with study of the machines/processes)

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine.
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses.
11. Gas welding experiment.
12. Arc welding experiment.
13. Resistance welding experiment.
14. Soldering & Brazing experiment.
15. Study and understanding of limits, fits & tolerances.
16. Study of temperature measuring equipment's.
17. Measurement using Strain gauge.
18. Experiment on dynamometers.
19. To study the displacement using LVDT.

Course Outcomes:
Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.

COMPUTER AIDED MACHINE DRAWING-II LAB

L-T-P
0-0-2

Objectives:
To provide an overview of how computers can be utilized in mechanical component design.

Note: All drawing conforms to BIS Codes.

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts. List of Standard Abbreviation used.

Part Modelling: Introduction to part modelling of simple machine components using any 3D software (like CATIA, PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model ***(Minimum 24 machine components need to be developed).***

Part Modelling& Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Course Outcomes:
Upon completion of this course, the students can use computer and CAD software formodelling mechanical components.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI.
2. Machine Drawing by K.R. Gopalakrishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria& Sons.
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age publications.
5. Engineering Graphics with AutoCAD, Bethune, PHI.
6. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill.
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India.
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley.

Dr. A.P.J. Abdul Kalam Technical UniversityUttar Pradesh,Lucknow

Syllabus

for

B. Tech. Mechanical Engineering

Third Year

(Effective from the Session: 2018-19)

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS501	Managerial Economics	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	Sociology /Cyber Security	Applied Science	3--0--0	70	20	10	100	3
3	RME501	Machine Design-I	Core Deptt.	3--0--0	70	20	10	100	3
4	RME502	Heat & Mass Transfer	Core Deptt.	3--1--0	70	20	10	100	4
5	RME503	Manufacturing Science& Technology-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME051-054	Deptt. Elective Course-1	Core Deptt.	3--1--0	70	20	10	100	4
7	RME551	Design and Simulation Lab I	Core Deptt.	0--0--2	50		50	100	1
8	RME552	Heat & Mass Transfer Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME553	Manufacturing Technology-II Lab	Core Deptt.	0--0--2	50		50	100	1
10	RME559	Seminar – I		0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-1

1. **RME-051 IC Engines and Compressors**
2. **RME-052 Mechatronics and Microprocessor**
3. **RME-053 Finite Element Methods**
4. **RME-054 Engineering Optimization**

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-VI

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS601	Industrial Management	Applied Science	3--0--0	70	20	10	100	3
2	RUC601/ RAS602	Cyber Security/ Sociology	Applied Science	3--0--0	70	20	10	100	3
3	RME601	Fluid Machinery	Core Deptt.	3--0--0	70	20	10	100	3
4	RME602	Theory of Machines	Core Deptt.	3--1--0	70	20	10	100	4
5	RME603	Machine Design-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME061-064	Deptt. Elective Course-2	Core Deptt.	3--1--0	70	20	10	100	4
7	RME651	Fluid Machinery Lab	Core Deptt.	0--0--2	50		50	100	1
8	RME652	Theory of Machines Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME653	Design and Simulation Lab II	Core Deptt.	0--0--2	50		50	100	1
10	RME654	Refrigeration & Air-conditioning	Core Deptt.	0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-2

1. **RME061 Refrigeration & Air-conditioning**
2. **RME062 Production Planning and Control**
3. **RME063 Mechanical Vibration**
4. **RME064 Reliability Engineering**

MACHINE DESIGN-I **L T P**
3 0 0

8

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II

8

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor,Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III

8

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

UNIT IV

8

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

UNIT V

8

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.

3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1
Introduction to Heat Transfer:
Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :
General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :
Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2 Fins:
Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:
Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

UNIT-3
Forced Convection:
Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :
Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

5

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 0 0

Unit I
Metal Cutting-
Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Dynamometer, Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

9

Unit-II
Machine Tools
(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III
Grinding & Super finishing
(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:
Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV
B. Metal Joining (Welding)
Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds andremedies. Weld decay in HAZ

10

Unit-V
C. Introduction to Unconventional Machining and Welding
Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma- arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.

4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

DepartmentalElective Course-1

I C ENGINES & COMPRESSORS

L T P
3 1 0

Unit-1
Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.
Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles
Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II
SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.
Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine
Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III
CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.
Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings
Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV
Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.
Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.
Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V
Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.
Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:
1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

MECHATRONICS AND MICROPROCESSOR **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semiconductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semiconductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, "Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, "Introduction to Mechatronics & Measurement Systems, 4e", McGraw-Hill Education, 2014.
3. M Jouaneh, "Fundamentals of Mechatronics", Cengage Learning, 2013.
4. W. Bolton, "Mechatronics", Pearson Education, Second Edition, 1999.
5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, "Mechatronics", Chapman and Hall, 1993.
6. Dan Necsulesu, "Mechatronics", Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, "Mechatronics", McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, "Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics", Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. "Mechatronics: Integrated Mechanical Electronic Systems", Wiley

FINITE ELEMENT METHODS **L T P**

3 1 0

Unit 1

Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.

Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II

Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III

Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV

Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials. Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V

Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.

Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning

3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduct
ion:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Integer linear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariableoptimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane methodand Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random,Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution ofunconstrained problem from arithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

Design and Simulation - Lab I

L T P
0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

HEAT & MASS TRANSFER – LAB

L T P
0 0 2

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment

Heat exchanger - Counter flow experiment

MANUFACTURING TECHNOLOGY-II – LAB

L T P
0 0 2

Mini

mum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

SEMESTER - VI

FLUID MACHINERY **L T P**
3 0 0

UNIT-I
Introduction: Impulse of Jet and Impulse Turbines:
Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat &curve), Classification of turbines, Impulse turbines, Constructional details, Velocitytriangles, Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II
Reaction Turbines:
Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

8

UNIT-III
Centrifugal
Pumps:
Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV
Positive Displacement and other Pumps:
Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

UNIT-V

8

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram,hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, 'Course on OpenFOAM', IIT Bombay(http://spoken-tutorial.org/)

BOOKS:

1. Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

THEORY OF MACHINES **L:T:P**
3: 1: 0

Unit I **8**

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center .

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism,.

Unit II **8**

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration,

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

Unit III **8**

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

Unit IV **8**

Balancing
:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia

governors. Effort and Power of governor

Unit V

8

Brakes and dynamometers:
Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

MACHINE DESIGN-II

L:T:P
3: 0: 0

UNIT I
Principle of transmission and conjugate action
Spur Gears
Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears
Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

UNIT II Bevel gears
Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears
Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III
Sliding Contact Bearing
Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

DepartmentalElective Course-II

REFRIGERATION & AIR CONDITIONING **L T P**

3 1 0

Unit-1

Refrigerat

ion:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:
Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4
Air Conditioning:
Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5
Refrigeration Equipment & Application:
Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production
Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.

7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I
Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II
Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III
Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

RELIABILITY ENGINEERING **L T P**
3 1 0

UNIT-I

8

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

UNIT-II

8

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

UNIT-III

8

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

UNIT-IV

8

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

UNIT-IV **8**

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

FLUID MACHINERY Lab **L T P**
0 0 2

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms

2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

Design And Simulation - Lab II **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as Cand C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computerprogram and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of asubsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.

11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

L	T	P
3	1	0

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20016-17]

YEAR IV, SEMESTER-VII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-071 to 074	Open Elective -I	3	1	0	30	20	50	100	150	4
2	NME-701	CAD	3	1	0	30	20	50	100	150	4
3	NME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
4	NME-031 to NME-034	Departmental Elective – III	3	1	0	30	20	50	100	150	4
5	NME-041 to NME-044	Departmental Elective – IV	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-751	CAD/CAM Lab	0	0	2	10	10	20	30	50	1
6	NME-752	I. C. Engine and Automobile Lab.	0	0	2	10	10	20	30	50	1
7	NME-753	INDUSTRIAL TRG.	0	0	2	-	50	50	-	50	1
8	NME-754	PROJECT	0	0	3	-	50	50	-	50	2
	GP-701	GP	-	-	-	-	-	50	-	50	-
		TOTAL	15	5	9					1000	25

Note- Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through report and viva voce etc.
Project should be initiated in 7th semester beginning **(End Semester Examination to be conducted for evaluation for 7th sem),** and should be complete by the end of 8th semester with good Report and power-point Presentation etc.

Open Electives – I

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operations Research
NOE-074 Introduction to Biotechnology

Departmental Elective III

NME-031 Computer Aided Manufacturing
NME-032 Project Management
NME-033 Computational Fluid Dynamics
NME-034 Composite materials

Departmental Elective IV

NME-041 Total Quality Management
NME-042 Thermal Turbo Machines
NME-043 Mechanical System Design
NME-044 Automation and Robotics

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NPI-801	Quality Control	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective –V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective -V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing.

NME-701: COMPUTER AIDED DESIGN (CAD) **L T P**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

8

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation .

8

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

8

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/Draftsight (any one)&3d solid modeling software Solidworks/Autodesk Inventor/PTC Creo /Catia (Any one)etc.

8

UNIT-V

Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

8

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India

2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill
4. CAD/CAM: Computer Aided Design and Manufacturing, by Groover, Pearson India
5. Mathematical Elements for Computer Graphics, buy Rogers and Adams, McGraw Hill
6. Finite Element Method By S S Rao
7. FE Analysis Theory and Programming, by Krishnamoorthy, Tata McGraw Hill

NME-702: AUTOMOBILE ENGINEERING **L T P**
3 1 0

UNIT-I

Introduction:

Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

6

UNIT-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

8

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

5

Chasis and Suspension System:

Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system,Air suspension & shock absorbers.

5

UNIT-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

4

UNIT-V

Emission standards and pollution control :

Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives and modern trends in automotive engine efficiency and emission control.

5

Maintenance system:

Preventive maintenance, break down maintenance and over hauling.

2

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automobile Engineering –TTTI, Pearson India
5. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.
7. Automobile Engineering –Ramakrishna, PHI, India

NME:801 POWER PLANT ENGINEERING **L T P**

3 1 0

UNIT-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations.

3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor.s profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

3

UNIT-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

8

UNIT-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, ubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

6

UNIT-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.

3

Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.

4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

2

UNIT-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc.

2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms.

3

Pollution

Pollution due to power generation

2

Books and References:

1. Power Plant Engineering, by F.T. Morse, Affiliated East-West Press Pvt. Ltd
2. Power Plant Engineering by Hedge, Pearson India
3. Power Plant Technology, by Wakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
6. Power Plant Engineering by Gupta, PHI India
7. Power Plant Engineering. Mahesh Verma, Metropolitan Book Company Pvt. Ltd.

NPI- 801 : **QUALITY CONTROL** **L T P**
3 1 0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability.

3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation.

5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

8

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.

3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.
MTBF. Maintainability, Condition monitoring and dignostic techniques.

4

Value Engineering : Elements of value analysis, Techniques.

2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts.

6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

2

Books and Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

NME-751:CAD/CAM LAB

L	T	P
0	1	2

Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.

3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

NME-752: I.C. ENGINES AND AUTOMOBILE LAB

L	T	P
0	0	2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.

8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

DEPARTMENT ELECTIVE-III

NME-031: COMPUTER AIDED MANUFACTURING (CAM) **L T P**
3 1 0

UNIT-I

Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

8

UNIT-II

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system.
Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

8

UNIT -III

Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.
System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

8

UNIT -IV

NC Part Programming- (a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.
(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

8

UNIT-V

Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

8

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.
6. CAD/CAM: Concepts and Applications by Alavala, PHI India
7. Computer Aided Manufacturing, by Srinivas, Oxford University Press.

NME-032: PROJECT MANAGEMENT **L T P**
3 1 0

UNIT-I
Project Management Concepts
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

8

UNIT-II
Project Organization & Project Contracts
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

8

UNIT-III
Project Appraisal & Cost Estimation
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

8

UNIT-IV
Project Planning & Scheduling
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

8

UNIT-V
Modification & Extensions of Network Models
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-

essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

8

Books and References :

1. Project Management by Harvey Maylor, Pearson India
2. Project Management by Choudhury, McGraw Hill
3. Project Management by K. Nagarajan
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
5. Project Management: A Life Cycle Approach by Kanda, PHI, India
6. Project Management and Appraisal, byKhatua, Oxford University Press.

NME-033: COMPUTATIONAL FLUID DYNAMICS **L T P**
3 1 0

UNIT- I
GOVERNING EQUATIONS AND BOUNDARY CONDITIONS:
Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averagedequations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behavior of PDEs onCFD. Elliptic, Parabolic and Hyperbolic equations.

8

UNIT -II
FINITE DIFFERENCE METHOD:
Derivation of finite difference equations. Simple Methods. General Methods for first and second orderaccuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations . Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

9

UNIT- III
FINITE VOLUME METHOD (FVM) FOR DIFFUSION:
Finite volume formulation for steady state One, Two and Three dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

9

UNIT -IV
FINITE VOLUME METHOD FOR CONVECTION DIFFUSION:
Steady one-dimensional convection and diffusion. Central, upwind differencing schemes-properties ofdiscretization schemes. Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICKSchemes.

10

UNIT- V
CALCULATION FLOW FIELD BY FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and itsvariants. Turbulence models, mixing length model, Two equation (k-Є) models. High and low Reynoldsnumber models

9

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis .
3. Computational Heat Transfer, by Jaluria ans Torrance, CRC Press
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.
9. Computational Fluid Dynamics: Principles and Applications, by Blazek, Elsevier Science & Technology.

NME-034: COMPOSITE MATERIALS **L T P**
3 1 0

UNIT-1

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

7

UNIT-II

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential.

7

UNIT-III

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.

10

UNIT-IV

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix

performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

10

UNIT-V

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

6

Books and References :

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy, by G. Dieter, McGraw Hill
3. Analysis and Performance of Fiber Composites, by Agarwal, McGraw Hill
4. Thermal Analysis of Materials, by R.F. Speyer, Marcel Decker
5. Engineering Mechanics and Composite Materials , by Daniels, Oxford University Press.
6. Engineering Materials: Polymers, Ceramics and Composites, by A.K Bhargava Prentice Hall India
7. Material Science and Engineering (SIE) with CD, by Smith, McGraw Hill

DEPARTMENT ELECTIVE-IV

NME-041: TOTAL QUALITY MANAGEMENT (TQM) **L T P**
3 1 0

UNIT -I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

4

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

4

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

3

UNIT -II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

5

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

3

UNIT -III

Tools and Techniques

Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart).

3

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

3

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

3

UNIT -IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

6

UNIT -V

IS0-9000 and its concept of Quality Management

ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT in some details.

6

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.
3. TQM in New Product manufacturing, H. G. Menon, McGraw Hill.
4. Total Quality Management, by Suri, Wiley.
5. Total Quality Management, by Subburaj, McGraw Hill.
6. Total Quality Management, by Poornima Chantimath, Pearson India
7. Quality Management by Bedi, Oxford University Press.
8. Total Quality Management-Text and Cases, by Janakiraman & Gopal, PHI, India.
9. Total Quality Management, H. Lal, Eastern Limited.
10. Total Quality Management, A. Arivalagar , R. S. Naagarazan, New Age International.

NME-042: THERMAL TURBOMACHINES **L T P**
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbomachinery, Energy transfer in turbo machines, Euler's equation, Definition of variousefficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology,Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps.

8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoitydiagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient,Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guidevanes, Centrifugal Compressor characteristic curves.

4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocitydiagram for axial compressor, Factors affecting stage pressure ratio, Blockage incompressor annulus, Degree of reaction, 3-D flow, Design process, blade design,calculation of stage performance, Axial compressor performance characteristic curves.

4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocitydiagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord,Estimation of stage performance, Characteristic curves.

4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

4

Pumps : Classification of Pumps, Main components, indicator diagram and modificationdue to piston acceleration, Performance characteristics, Cavitation and its control,Miscellaneous types of pumps.

4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropydiagram, State losses, Estimation of stage performance, Performance characteristics.

4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustionsystem types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparativeevaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Designwith traditional materials.

8

Books and References:

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Fundamentals of Turbomachinery by Venkanna, PHI, India
3. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.

4. Gas Turbine- Ganeshan, Tata Mc Graw Hill.
5. Thermal Turbomachines, by Singh, Wiley
6. Fundamentals of Turbomachinery, by Venkanna, PHI, India.

NME – 043: MECHANICAL SYSTEM DESIGN **L T P**
3 1 0

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, types of system, Application of system concepts, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

4

Problem Formulation : Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

4

UNIT-II

System Theories: Introduction, System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

4

System modeling

Introduction, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

4

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.

4

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

4

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.

4

Calculus Method for Optimization

Model with single decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

4

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

5

Books and References:

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Engineering Design, by Dieter, McGraw Hill
3. Design Engineering-JR Dixon, TMH, New Delhi
4. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
5. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
6. Optimization Techniques-SS Rao
7. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

NME-044: AUTOMATION AND ROBOTICS **L T P**
3 1 0

UNIT- I

AUTOMATION:

Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation.

Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

7

UNIT- II

Manufacturing Automation:

Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

7

UNIT- III

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source.

Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous

transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

9

UNIT -IV

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

9

UNIT- V

ROBOT SIMULATION

Methods of robot programming, Simulation concept, Off-line programming, advantages of off-line programming.

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

8

Books and Reference :

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India
5. Robotics , by J.J. Craig, Addison-Wesley.
6. Industrial Robots , by Groover, McGraw Hill.
7. Robots & Manufacturing Automation, by Asfahl, Wiley
8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India
9. Automation & Robotics, byGhoshal, Oxford University Press.
10. Introduction to AI Robotics, by Murphy, PHI, India.

DEPARTMENT ELECTIVE-V

NME-051: OPERATIONS RESEARCH **L T P**

3 1 0

UNIT-I

Introduction: Basic of Operation Research, Origin & development of Operation Research,Applications.

2

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

7

UNIT-II

Transportation Problem: Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced Transportation Problem.

4

Assignment Problem: Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

3

UNIT-III

Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming.

4

Sequencing: Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

3

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

4

Simulation: Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

4

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

3

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

6

Books and References:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley & Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand.
7. Operation Research Application and Algorithms, by- Wayne L Winston, Duxbury Press.
8. Operations Research, by Jha, McGraw Hill.
9. Operation Research, by Yadav & Malik Oxford University Press
10. Operations Research, by Panneerselvam, PHI, India

NME-052 : DESIGN OF THERMAL SYSTEMS **L:T:P**
3:1: 0

Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

5

Design & Selection of Air conditioning Apparatus **:**Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

3

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation. Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

8

Unit-III

Turbomachines:Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

8

Unit-IV

Design of Heat Exchanger :Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

8

Books and References:

1. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.
2. Refrigeration & Air Conditioning - By C.P. Arora, McGraw Hill
3. Refrigeration & Air Conditioning - By Manohar Prasad, New Age
4. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
5. Refrigeration & Air Conditioning Data Book – Manohar Prasad, New Age
6. ASHRAE Hand Book of Fundamentals-ASHRAE
7. Refrigeration & Air Conditioning-Stoecker & Jones, Mc Graw Hill
8. Design of High Efficiency Turbomachinery and Gas Turbine by Wilsonm and Korakianitis, PHI, India
9. Turbines compressors and Fans by Yahaya, Mc Graw Hill
10. Heat Transfer Equipment Design by Shah, CRC Press
11. Thermal System Design and Optimization by Balaji, Ane Books Pvt Ltd

NME-053: ADVANCE SYNTHESIS OF MECHANISMS

L T P
3 1 0

UNIT-I

Introduction:

Mechanisms: Classifications, Relative and absolute motion, degree of freedom, 4-barMechanisms, planar and spatial mechanisms, Inversion and equivalent linkage,Transmission angle.

4

Kinematic analysis of Planer motion: Relative velocity, Instantaneous centre, Poles and centrodes, Relative acceleration.

4

UNIT-II

Kinematic Synthesis: Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials.

4

Four bar linkage, Equation of coupler curves, Double points and symmetry, RobertChebyshev theorem, Approximate and exact straight line mechanisms .

4

UNIT-III

Graphical Synthesis of Mechanisms:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crankMechanism. Synthesis of four bar mechanisms.

8

UNIT IV

Analytical Synthesis:

Displacement equation of four bar linkage, Crank and follower synthesis with threeaccuracy points, Four bar function generator with three accuracy points, Crank andfollower synthesis, angular velocities and accelerations

8

UNIT-V

Analytical Synthesis:
Synthesis of slider crank mechanism with three accuracy points, Synthesis of slidercrank mechanism with four accuracy points, cam and follower mechanism, Analysis of mechanical errors in linkage.

8

Books and References:

1. Kinematic Synthesis of Linkages RS Hartenberg and J Denavit McGraw Hill, New York
2. Kinematic and Linkage Design AS Hall Jr Prentice Hall India Ltd.
3. Mechanism and Machine Theory Amitabh Ghosh and AK Mallick
4. Mechanism Design: Analysis &Synthesis Erdman & Sandor Prentice Hall of India
5. Kinematics and Dynamics of machinery (SIE), by Norton, McGraw Hill

NME-054: INDUSTRIAL AUTOMATION –I **L T P**
3 1 0

Unit-I:
Historical perspective of Industrial Automation
- Origin, Evolution and Need / Demand of automation in industries, Current and future Trends
- Components of Industrial Automation System and their functionalities, Layers and Types of Automation

6

Unit -II:
Automation Controllers
- Introduction of Industrial Controllers
- Programmable Logic Controller: Constructions, Types, Programming Units, Memory, I/O Modules.
- Programming methodology
- Ladder Logic programming for Industrial Applications, Timers and Counters
- Selection criteria of PLC
- Examples of PLC application

10

Unit-III:
Industrial Switching Elements
- Electronic Logic gates
- Relays, Solenoids
- Pneumatic Valves and Actuators
- Hydraulic valves and Actuators
- Interfacing: Control of Hydraulics and Pneumatics with Electric Signals
- Comparison between different switching elements

10

Unit-IV:
Visualization: Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA) Systems:

- Need for HMI
- Hardware based HMI panels
- PC based HMI Systems – SCADA
- Different Functionalities
- Benefits of implementing SCADA systems
- Case Studies of SCADA implementation.

10

Unit V:

Case Study

- Hydraulic / Pneumatic Press
- Material handling System
- Machine Tool: NC/CNC Machine

4

Books and References :

1. Programmable Logic Controllers with Control Logix, by Jon Stenerson, Delmar Publishers, 2009.
2. Hand book of industrial Automation, by Richard L Shell and Ernest L Hall, Marcel Dekker Inc., 2000.
3. Practical SCADA for Industry, by David Bailey and Edwin Wright, Newness Publishers, 2003.
4. Automation network Selection, by Dick Caro, ISA – The Instrumentation Systems and Automation Society, 2004.
5. Getting Factory Automation Right (the first time), by Edwin H Zimmerman, Manufacturing Engineers, 2001.
6. Automation, Production Systems and Computer Integrated Manufacturing, by Groover, Pearson India.
7. Industrial Instrumentation and Control, by Singh, McGraw Hill.

NME-055: ADVANCED WELDING TECHNOLOGY **L T P**
3 1 0

UNIT-I

Introduction: Welding as compared with other fabrication processes,Importance and application of welding, classification of welding processes, Health & safety measures in welding.

3

Welding Power Sources: Physics of welding Arc**,** Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

3

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

4

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

3

UNIT-II

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrogas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

11

UNIT-III

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

5

UNIT-IV

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

2

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.

4

UNIT-V

Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

5

Books and References:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principals and Practices, by- Edwars R. Bohnart, McGraw Hill Education.
3. Welding Engineering and Technology, by- R. S. Parmar, Khanna Publishsers.
4. Welding Handbooks (Vol. I & II).

DEPARTMENT ELECTIVE-VI

NME- 061: EXPERIMENTAL STRESS ANALYSIS **L T P**
3 1 0

UNIT -I

Stress: Introduction, Two-Dimensional State of Stress, Equations of Equilibrium, Stress Transformation relations, principal Stresses, Special States of Stress.

4

Strain: Introduction, Displacement and Strain, Strain Transformation relations, principal strains, Stress Strain Relations, for Two-Dimensional State of Stress.

4

UNIT- II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis.

4

Brittle Coating Method: Introduction, Coating Stresses, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

4

UNIT -III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor.

4

Strain Gage Circuit: Potentiometer, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.Three Element Rectangular Rosette

4

UNIT- IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Stressed Model in Circular Polariscope.

8

UNIT -V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method.

8

Books and References :

1. Experimental Stress Analysis, by U C Jindal, Pearson India
2. Experiment Stress Analysis, by James W. Dally and William F. Riley, McGraw-Hill International
3. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.
4. Advance Strength and Applied Stress Analysis, by Budynas, McGraw-Hill

NME- 062: PLANT LAYOUT AND MATERIAL HANDELING **L T P**
310

UNIT -I

Introduction

Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

8

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design

Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

8

UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic.

Material Handling: Material handling principles; material handling equipment and material handling systems.

8

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. **Warehouse operations**: function, storage operations.

Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems,

Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.

8

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

8

Books and References:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6. Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons.
7. Plant Design and Economics, by- Peters, McGraw Hill Education.
8. Purchasing and Material Management, by- Gopalakrishnan, McGraw Hill Education.

NME-063: ADDITIVE MANUFACTURING

L	T	P
3	1	0

UNIT-I

Introduction

History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, **Direct and Indirect Processes;** Prototyping, Manufacturing and Tooling.

4

Layer Manufacturing Processes; Polymerization, Sintering and Melting, Extrusion, Powder-Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosolprinting and Bioplotter.

4

UNIT-II

Development of Additive Manufacturing Technology

Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems.

3

Generalized Additive Manufacturing Process Chain; The Eight Steps in Additive Manufacturing, Variation from one AM Machine to Another, Metal System, Maintenance of Equipment, Material Handling Issue, Design of AM.

5

UNIT-III

Additive Manufacturing Processes

Vat Photopolymerization; Materials, Reaction Rates, Photopolymerization Process Modeling, Scan Patterns, **Powder Bed Fusion Processes;** Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling, **Extrusion Based System;** Basic principles, plotting and Path Control, Bioextrusion, Other Systems, **Material Jetting;** Materials, Material Processing Fundamentals, Material Jetting Machines, **Binder Jetting;** Materials, Process Variations, BJ Machines, **Sheet lamination Processes;** Materials, Ultrosonic Additive Manufacturing, **Directed Energy Deposition Processes;** General DED Process Description, Material Delivery, DED systems, Process Parameters, Processiong-Structure-Properties Relationships, **Direct Write Technologies;** Ink-Based DW, laser Transfer DW, Thermal Spray DW, Beam Deposition DW, Liquid Phase Direct Deposition, Hybrid Technologies.

8

UNIT-IV

Design & Software Issues

Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM.

4

Software Issue for Additive Manufacturing; Introduction, Preperation of CAD Models: The STL file, Problem with STL file, STL file Manupulation, Beyond the STL file, Additional Software to Assist AM.

4

UNIT-V

Material Design & Quality Aspects

Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Intellectual Property, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing, Business Opportunities

4

Applications

Aerospace, Automotive, Manufacturing, Architectural Engineering, Art, Jewelry, Toys, Medical, Biomedical, Dental, Bio-printing, Tissue & Organ Engineering and many others.

4

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson , DSavid W. Rosen , Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
4. Rapid Prototyping: Principles and Applications, by - Chee Kai Chua, Kah Fai Leong, Chu Sing Lim.

NME-064: COMPUTER AIDED PROCESS PLANNING **L T P**
3 1 0

UNIT-I

Introduction to CAPP: Principles, scope and information requirement for CAPP, Role of process planning, Manual and experienced based process planning, Advantages of CAPP over conventional process planning, Decision table and decision trees, process capability analysis, Tolerance analysis, Variant process planning, Generative approach, Forward and Backward planning.

8

UNIT-II

Computer Aided Process Planning: Logical design of process planning systems, Implementation considerations, Computer based process monitoring and control, Computer and process interfacing, Totally integrated process planning systems, Process planning for rotational and prismatic parts, Machining of curves and surfaces, Five axis machining, Process planning of freedom surfaces, Development of NC codes, Computer aided design of fixtures, Inspection policies and inspection planning, Expert systems and their use in developing process planning systems.

8

UNIT-III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications. Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples. Generative CAPP system: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

8

UNIT-IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes, design and manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances.

8

UNIT-V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods. Implementation techniques for CAPP: MIPLAN system, Computer programming languages tbr CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

8

Books and References:

1. Production Systems and Computer Integrated Manufacturing System, by- Mikell P Groover, Prentice Hall.
2. Computer Processing of Remotely Sensed Images: An Introduction, 3rd Edition, by- Mather Paul, Wiley.
3. Computer Aided Process Control, by- SK Singh, PHI Learning Pvt. Ltd.
4. Computer Aided Design and Manufacturing, by- M. Sarcar, K. L. Narayan, PHI Learning Pvt. Ltd.

NME-065: NON-DESTRUCTIVE TESTING **L T P**
3 1 0

Unit-I

Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

6

Unit-II

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zyglo test, Illustrative examples and interpretation of defects.

5

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Non-ferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

5

Unit-III

Radiographic methods

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ-ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

8

Unit-IV

Ultrasonic testing methods

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

8

Unit-V

Special NDT Techniques

Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

8

Books and References:

1. Non-Destructive Testing and Evaluation of Materials, by- Prasad, McGraw Hill Education.
2. Basics of Non-Destructive Testing, by Lari & Kumar, KATSON Books.
3. Practical Non-destructive Testing, by- Baldev Raj, T. Jayakumar, M. Thavasimuthu, Woodhead Publishing.
4. Non-Destructive Testing Techniques, by- Ravi Prakash, New Age International.
5. Nondestructive Testing Handbook,by Robert C. McMaster, American Society for Nondestructive.
6. Introduction to Nondestructive Testing: A Training Guide, by- Paul E. Mix, wiley.
7. Electrical and Magnetic Methods of Non-destructive Testing, by- J. Blitz, springer.

Board of Technical Education, Uttar Pradesh

STUDY & EVALUATION SCHEME

For

DIPLOMA IN PHARMACY

AT

DEPARTMENT OF PHARMACY

MEERUT INSTITUTE OF TECHNOLOGY

Approved by Pharmacy Council of India (PCI), New Delhi and All India Council for Technical Education (AICTE), New Delhi & Affiliated to Board of Technical Education, Uttar Pradesh (BTEUP), Lucknow

College Code: 1911

ORDINANCE, SCHEME & SYLLABUS FOR DIPLOMA IN PHARMACY

Course Title : Diploma in Pharmacy
Abbreviation : D. Pharm.
Type of Course : A Two years Diploma course
Pattern : Yearly
Award of the Degree : Diploma will be awarded for those passing in both the years as per rules and regulations.

O-D. Ph. 1. DURATION OF THE COURSE: The duration of the course shall be for two academic years, with each academic year spread over a period of not less than one hundred and eighty working days in addition to 500 hours practical training spread over a period of not less than 3 months.

O-D. Ph.2. ELIGIBILITY FOR ADMISSION: No. Candidate shall be admitted to Diploma in Pharmacy Pt. I unless he/she had passed any of the following examinations in all the optional subjects and compulsory subjects (Physics, Chemistry, Biology and /or Mathematics including English as one of the Compulsory subjects):

a) Intermediate examination in Science; The First Year of the three year degree course in Science; 10+2 Examination(Academic stream) in Science;
b) Pre-degree examination; any other qualification approved by the Pharmacy Council of India as equivalent to any of the above exam.

Admission of candidates to the Diploma in Pharmacy Part - I shall be made in order of merit on the basis of 'Pre-Pharmacy Test' conducted in accordance with the scheme of Examinations and syllabus laid-down by the University.

O- D. Ph.3. ELIGIBILITY FOR APPEARING IN EXAMINATION

(a) Eligibility for appearing at the Diploma in Pharmacy Part-I Examination: Only such candidates who produce-certificate from the Head of the Academic Institution in which he/she has undergone the Diploma in Pharmacy Part-I course, in proof of his/her having regularly and satisfactorily undergone the course of study by attending not less than 75% of the classes held both in theory and in practical separately in each, shall be eligible for appearing at the Diploma in Pharmacy (Part-I) examination.
(b) Eligibility for appearing at the Diploma in Pharmacy Part-II Examination: Only such candidates who produce certificate from the Head of the academic institution in which he/she has undergone the Diploma in Pharmacy Part-II course, in proof of his/her having regularly and satisfactorily attending not less than 75% of the classes held both in theory and practicals separately in each subject, shall be eligible for appearing at the Diploma in Pharmacy (Part-II) examination.
(c) A candidate can have a relaxation of 10% attendance on medical ground by producing a certificate from medical officer of government hospital and a 5% relaxation by the vice chancellor on the recommendation of Dean, faculty.

O-D. Ph. 4.GENERAL

(A) **Course of Study**: The course of study for Diploma in Pharmacy part-I and Diploma in pharmacy part- II shall include the subjects as given in the Tables I & II below. The number of hours devoted to each subject for its teaching is given against columns 2 and 3 of the Tables below.

TABLE-I Diploma in Pharmacy (Part-I)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-I	75	3	100	4
Pharmaceutical Chemistry-I	75	3	75	3
Pharmacognosy	75	3	75	3
Biochemistry & Clinical Pathology	50	2	75	3
Human Anatomy & Physiology	75	3	50	2
Health Education & community pharmacy	50	2		
	400	16	375	15

TABLE-II Diploma in Pharmacy (Part-II)

Subject	Theory		Practical	
	hours /year	Hrs. /week	hours /year	Hrs/ week
Pharmaceutics-II	75	3	100	4
Pharmaceutical Chemistry-II	100	4	75	3
Pharmacology & Toxicology	75	3	50	2
Pharmaceutical Jurisprudence	50	2	-	
Drug store and Business Management	75	3	-	
Hospital & Clinical Pharmacy	75	3	50	2
	450	18	275	11

(b) Examinations: There shall be an examination for Diploma in Pharmacy (part-I) to examine students of the first year course and an examination for Diploma in Pharmacy (part-II) to examine students of the second year course. Each examination may be held twice every year. The first examination in every year shall be the annual examination and the second examination shall be supplementary examination of the Diploma in Pharmacy (part-I) or Diploma in pharmacy (Part-II)as the case may be. The examinations shall be of written and practical (including oral) nature. Carrying maximum marks for each part of subject, as indicated in Table III and IV:R-29(A) (Plan and scheme of examination for Diploma in Pharmacy).

O-D. Ph.5. PRACTICAL TRAINING

Diploma in Pharmacy (Part-III)

(a)Period and other conditions of practical training:

After having appeared in Part-II examination of Diploma in Pharmacy conducted by Board/University or other approved examination Body or any other course accepted

as being equivalent by the Pharmacy Council of India, a candidate shall be eligible to undergo practical training in one or more of the following institutions namely:
Hospitals/Dispensaries run by Central/State Government/Municipal corporations/ central Government Health scheme and Employees state Insurance scheme. A pharmacy, chemist and Druggist licensed under the Drugs and cosmetics Rules, 1945 made under the Drugs and Cosmetics Act,1940(23 of 1940). The institutions referred in sub-regulation(1)shall be eligible to impart training subject to the condition that the number of student pharmacists that may be taken in any Hospital, pharmacy, Chemist and Druggist licensed under the Drugs and cosmetics Rules,1945 made under the Drugs and cosmetics Act,1940 shall not exceed two where there is one registered pharmacist engaged in the work in which the student pharmacist is undergoing practical training, where there is more than one registered pharmacist similarly engaged, the number shall not exceed one for each additional such registered pharmacist. Hospital and Dispensary other than those specified in sub-regulation(1)for the purpose of giving practical training shall have to be recognized by pharmacy council of India on fulfilling the conditions specified in Appendix-D to these regulations.

In the course of practical training, the trainees shall have exposure to: Working knowledge of keeping of records required by various acts concerning the profession of pharmacy and Practical experience in the manipulation of pharmaceutical apparatus in common use, the reading, translation and copying of prescription including checking of dose, the dispensing of prescriptions illustrating the commoner methods of administering medicaments; the storage of drugs and medical preparations. The practical training shall be not less than five hundred hours spread over a period of not less than three months provided that not less than two hundred and fifty hours and devoted to actual dispensing of prescriptions.

(b) **Procedure to be followed prior to commencing of the training**:

The head of the academic training institution, shall supply application in triplicate in' Practical Training Contract Form for Qualification as pharmacist' to candidate eligible to under-take the said practical training, the contract form shall be as specified in Appendix-E to these regulations.
The head of an academic training institution shall fill section I of the contract Form. The trainee shall fill section II of the said contract Form and the Head of the institution agreeing to impart the training (hereinafter referred to as the Apprentice Master) shall fill section III of the said contract Form.
It shall be the responsibility of the trainee to ensure that one copy (hereinafter referred to as the first copy of the contract Form)so filled is submitted to Head of the academic training institution and the other two copies(hereinafter referred to as the second copy and the third copy)shall be filled with Apprentice Master(if he so desires)or with the trainee pending completion of the training.

(c) **Certificate of Passing Diploma in Pharmacy(part-III)** on satisfactory completion of the apprentice period, the Apprentice Master shall fill Section IV of the second copy and third copy of contract form and cause it to be sent to the head to the academic training institution who shall suitably enter in the first copy of the

entries from the second copy and third copy and shall fill section V of the three copies of contract form and thereafter handover both the second copy and the third copy to the trainee. Thus, if completed in all respect, shall be regarded as a certificate of having successfully completed the course of Diploma in Pharmacy (part-III).

O-D. Ph.6. Working out of Result

(a) Mode of examinations:

Each theory and practical examination in the subject mentioned in Table-III and IV shall be of three hours duration. A candidate who fails in theory or practical examination shall reappear in such theory or practical paper(s) as the case may be. Practical examination shall also consist of viva voce (oral) examination.

(b) Award of sessional marks and maintenance of records:

A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Diploma in Pharmacy Part-I and Diploma in pharmacy Part-II courses, shall be maintained for each student in the institution and 20 marks for each theory and 20 marks for each practical subject shall be allotted as sessional.

There shall be at least three periodic sessional examinations during each academic year. The highest aggregate of any two performances shall form the basis of calculating sessional marks.

The sessional marks in practicals shall be allotted on the following basis:

Actual performance in the sessional examination.	10
Day to day assessment in the practical class work.	10

(c) Minimum marks for passing the examination: A student shall not be declared to have passed Diploma in Pharmacy examination unless he/she secures atleast 40% marks in each of the subject separately in theory examination, including sessional marks and atleast 40% marks in each of the practical examination including sessional marks. The candidates securing 60% marks or above in aggregate in all subjects in a single attempt at the Diploma in Pharmacy (part-I)or Diploma in Pharmacy(part- II)examinations shall be declared to have passed in first class the Diploma in Pharmacy(part-I)of Diploma in Pharmacy (part-II)examinations, as the case may be. Candidates securing 75% marks or above in any subject or subjects provided he/she passes in all the subjects in single attempt, will be given distinction in that subjects(s).

(d) Eligibility for Promotion to Diploma in Pharmacy (Pt. II): All candidates who have appeared for all the subjects and passed the Diploma in pharmacy part-I class. However failure in more than two subjects (each Theory paper or practical examination shall be considered as a subject) shall debar him/her from promotion to the Diploma in Pharmacy Part-II class. Such candidates shall be examined in the failing subjects only at subsequent. A candidate who fails to pass D Pharm Part - I exam. in four attempts shall not allowed to continue the course.

(e) Improvement of sessional marks: Candidates who wish to improve sessional marks can do so by appearing in two additional sessional examinations during the next academic year. The average score of the two examinations shall be the basis for improved sessional marks in theory. The sessional of practicals shall be improved by appearing in additional practical examinations. Marks awarded to a candidate for day to day assessment in the practical class, can not be improved unless he/she attends regular course of study again.

(f) Certificate of passing examination for Diploma in Pharmacy (part-II): Certificate of having passes the examination for the Diploma in pharmacy Part-II shall be granted by the Examining Authority to a successful student.

(g) Certificate of Diploma in Pharmacy: A certificate of Diploma in pharmacy shall be granted by the Examining Authority to successful candidate on producing certificate of having passed the Diploma in Pharmacy part-I and Part-II and satisfactory completion of practical training for Diploma in pharmacy (part-III).

(h) The chairman and at least one expert member of examining committee of the Examining Authority Concerned with appointment of examiners and conduct of pharmacy examination should be persons possessing pharmacy Qualifications.

PLAN AND SCHEME OF EXAMINATION FOR THE DIPLOMA IN PHARMACY

(Based on effective teaching for 180 working days in one academic session)

Table-III Diploma in pharmacy (part-I) Examination

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	**Sessionall**	**Total**	**Examination**	**Sessional**	**Total**
Pharmaceutics-I	80	20	100	80	20	100
Pharmaceutical Chemistry-I	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Biochem. & Clinical Pathology	80	20	100	80	20	100
Human Anatomy & Physiology	80	20	100	80	20	100
Health Education & community pharmacy	80	20	100			
			600			500

TABLE-IV Diploma in Pharmacy (Part-II)

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	**Sessional**	**Total**	**Examination**	**Sessional**	**Total**
Pharmaceutics-II	80	20	100	80	20	100
Pharmaceutical Chemistry-II	80	20	100	80	20	100
Pharmacology & Toxicology	80	20	100	80	20	100
Pharmaceutical Jurisprudence	80	20	100			
Drug store and Business Management	80	20	100			
Hospital & Clinical Pharmacy	80	20	100	80	20	100
			600			400

Note: Each paper shall consist of six questions out of which five shall be attempted. Half of the total number of papers in each year will be set and assessed by external examiners and the remaining half will be set and assessed by the internal examiners. There shall be one external and one internal examiner for each practical Examination.

SYLLABUS

DIPLOMA IN PHARMACY (PART-I)

1.1 PHARMACEUTICS I

Theory (75 Hours)

Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarization with new drug delivery systems. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

Metrology-System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products .Use of alligation method in calculations
.Isotonic solutions.

Packaging of pharmaceuticals-Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.
Size reduction, objectives, and factors affecting size reduction, methods of size reduction-study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

Size separation-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

Mixing and Homogenization-Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, planetary Mixer; Agitated powder mixer; Triple Roller Mill; Propeller Mixer, colloid Mill and Hand Homogeniser. Double cone mixer.

Clarification and Filtration-Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, sintered filters, Filter candles, Metafilter.

Extraction and Galenicals-

(a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts.
(b) Introduction to Ayurvedic dosage forms.

Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.

Distillation-Simple distillation and Fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of purified water I.P. and water for Injection I.P. construction and working of the still used for the same.

Introduction to drying process-Study of Tray Dryers; Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.

Sterilization-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process.
Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization.

Aseptic techniques-Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

Processing of Tablets-Definition; different type of compressed tables and their properties. Processes involved in the production of tablets; Tablets excipients ; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be de.. in an elementary manner).

Processing of Capsules-Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.

Study of immunological products like sera, vaccines, toxoids & their preparations.

PRACTICAL (100 hours)

Preparation (minimum number stated against each of the
following categories illustrating different techniques involved.
1. Aromatic waters3
2. Solutions 4
3. Spirits2
4. Tinctures4
5. Extracts2
6. Creams2
7. Cosmetic preparations3
8. Capsules2
9. Tables2
10. Preparations involving2
11. Opthalmic preparations2
12. Preparations involving aseptic techniques2

Books recommended:(Latest editions)
1.) Remington's Pharmaceutical Sciences.
2.) The Extra Pharmacopoeia-Martindale.

1.2 PHARMACEUTICAL CHEMISTRY-I

THEORY (75 Hours)

General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

Acids, bases and buffers-Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

Gastrointestinal agents-
Acidifying agents- Dilute Hydrochloric acid.
Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.
Protective and Adsorbents- Bismuth sub carbonate and Kaolin.
Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

Topical Agents-
Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.
Antimicrobials and Astringents- Hydrogen peroxide*, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone-iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury yellow, Mercuric oxide, Ammoniated mercury.
Sulphur and its compounds- Sublimed sulphur, Percipitated sulphur, Selenium sulphide. Astringents- Alum and Zinc Sulphate.

Dental Products- Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Di- calcium phosphate ,Strontium chloride, Zinc chloride.
Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

Respiratory stimulants- Ammonium carbonate.

Expectorants and Emetics-Ammonium chloride*, Potassium iodide, Antimony potassium tartrate.

Antidotes- Sodium nitrite.

Major Intra and Extra cellular electrolytes-
Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations.
Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection.

Combination of oral electrolyte powders and solutions.

Inorganic official compounds of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.

Radio pharmaceuticals and contrast media- Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media- Barium sulfate.

Quality control of Drugs and pharmaceuticals-Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.

Identification tests for cations and anions as per Indian Pharmacopoeia.

PRACTICAL (75 hours)

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.
2. Limit test for chloride, Sulfate, Arsenic, Iron and Heavy metals.
3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds marked with (*) under theory.
    i. Acid-Base titrations(at least 3)
    ii. Redox titrations (one each of permanganometry and iodimetry).
    iii. Precipitation titrations (at least 2)
    iv. Complexometric titration (Calcium and Magnesium).

Books recommended (Latest editions)

1. Indian pharmacopoeia.

1.3 PHARMACOGNOSY

THEORY (75 Hours)

1. Definition, history and scope of Pharmacogonosy including indigenous system of medicine.
2. Various systems of classification of drugs and natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.
4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

(a) **Laxatives**- Aloes, Rhubarb, Castor oil, Ispaghula, Senna.

(b) **Cardiotonics**- Digitalis, Arjuna.

(c) **Carminatives & G.I. regulators**- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper , Asafoetida, Nutmeg, Cinnamon, Clove.

(d) **Astringents**- Catecheu.

(e) **Drugs acting on nervous system**- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux -vominca.

(f) **Antihypertensive**- Rauwolfia.

(g) **Antitussives**- Vasaka, Tolu balsam, Tulsi.

(h) **Antirheumatics**- Guggal, Colchicum.

(i) **Antitumour**- Vinca.

(j) **Antileprotics**- Chaulmoogra oil.

(k) **Antidiabetics**- Pterocarpus, Gymnema sylvestro.

(l) **Diuretics**- Gokhru, Punarnava.

(m) **Antidysenterics**- Ipecacuanha.

(n) **Antiseptics and disinfectants**- Benzoin, Myrrh, Neem, Curcuma.

(o) **Antimalarials**- Cinchona.

(p) **Oxytocics**- Ergot.

(q) **Vitamins**- Shark liver oil and Amla.

(r) **Enzymes**- Papaya, Diastase, Yeast.

(s) **Perfumes and flavoring agents**- peppermint oil, Lemon oil, Orange oil, lemon grass oil, sandal wood.

Pharmaceutical aids-Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia,
Tragacanth, sodium Alginate, Agar,
Guar gum, Gelatin.
Miscellaneous- Liquorice, Garlic, picrorhiza, Dirscorea, Linseed, shatavari, shankhpushpi, pyrethrum, Tobacco.
Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwalfia, Digitalis, senna.
Study of source, preparation and identification of fibers used in sutures and surgical dressings-cotton ,silk, wool and regenerated fibers.
Gross anatomical studies of-senna , Datura, cinnamon, cinchona, fennal, clove, Ginger, Nuxvomica & ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drugs by morphological characters. Physical and chemical tests for evaluation of drugs wherever applicable.
2. Gross anatomical studies(t.s.)of the following drugs :Senna, Datura, cinnamon, cinchona, coriander, fennel , clove, Ginger, Nux-vomica, Ipecacuanha.
3. Identification of fibers and surgical dressing.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

THEORY (50 Hours)

Introduction to biochemistry. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.

Carbohydrates: Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.

Lipids: Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.

Vitamins: Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes.

Enzymes: Brief concept of enzymatic action. factors affecting it.

Therapeutics: Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

PRACTICAL (75 Hours)

1. Detection and identification of proteins. Amino acids, carbohydrates and lipids.
2. Analysis of normal and abnormal constituents of Blood and Urine (Glucose, urea, creatine, cretinine, cholesterol, alkaline phosphatatase acid phosphatase, Bilirubin, SGPT, SGOT, calcium, Diastase, Lipase).
3. Examination of sputum and faeces (microscopic & staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes, withdrawal of blood samples.

1.5 HUMAN ANATOMY AND PHYSIOLOGY

THEORY(75 Hours)

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeltal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas

Reproductive system: Physiology and Anatomy of Reproductive system.

PRACTICALS (50 hours)

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:

Digestive system	Respiratory system	Ear
Cardiovascular system	Urinary system	
Reproductive system	Eye	

3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

1.6 HEALTH EDUCATION AND COMMUNITY PHARMACY

THEORY (50 hours)

Concept of health: Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.

Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.
Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.

First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.

Environment and health: Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases.

Fundamental principles of microbiology: Classification of microbes, isolation, staining techniques of organisms of common diseases.

Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections- chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.

Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.

Arthropod borne infections-plague, Malaria, filariases.

Surface infection-Rabies, Tranchoma, Tetanus, Leprosy. **Sexually transmitted diseases**-Syphilis, Gonorrhoea, AIDS.

Non-communicable diseases: causative agents, prevention, care and control.

Epidemiology: Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments.

2.1 PHARMACEUTICS II
(Dispensing Pharmacy)

THEORY (75 Hours)

Prescriptions-Reading and understanding of prescriptions; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
Incompatibilities in prescriptions- study of various types of incompatibilities-physical, chemical and therapeutic.
Posology- Dose and dosage of drugs, factors influencing dose, calculations of doses on the basis of age, sex, surface area and veterinary doses.
Dispensed Medications: (Note: A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures. special labeling requirements and storage conditions should be high-lighted).
Powders-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates. preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.

Liquid oral Dosage forms:
Monophasic-Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colorants and flavors, with examples.
Review of the following monophasic liquids with details of formulation and practical methods. Liquids for internal administration Liquids for external administration or used on mucous membranes
Mixtures and concentrates, Gargles

Syrups Mouth washes	Throat-paints	Elixirs
Douches	Ear Drops	Nasal drops
Sprays	Liniments	Lotions.

Biphasic Liquid Dosage Forms:
Suspensions (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant used like thickening agents, wetting agents, their necessity and quantity to be incorporated ,suspensions of precipitate forming liquids like tinctures, their preparations and stability. suspensions produced by chemical reaction. An introduction to flocculated /non-flocculated suspension system.
Emulsions-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.

Semi-Solid Dosage Forms:

Ointments: Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes:

Trituration fusion
chemical reaction Emulsification.

Pastes: Differences between ointments and pastes, Bases of pastes. preparation of pastes and their preservation .

Jellies: An introduction to the different types of jellies and their preparation. An elementary study of poultice.

Suppositories and peassaries-Their relative merits and demerits, types of suppositories, suppository bases , classification, properties. preparation and packing of suppositories. Use of suppositories of drug absorption.

Dental and cosmetic preparations: Introduction to Dentifrices, facial cosmetics, Deodorants. Anti- perspirants, shampoo, Hair dressings and Hair removers.

Sterile Dosage forms:

Parenteral dosage forms-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and personnel, Facilities and quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids.

Sterility testing: particulate matter monitoring- Faculty seal packaging.

Ophthalmic products: study of essential characteristics of different ophthalmic preparations. Formulation: additives, special precautions in handling and storage of ophthalmic products.

PRACTICAL (100 hours)

Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsion, solutions, liniments, E.N.T. preparations. Ointments, suppositories, powders, incompatible prescriptions etc.

Books recommended: (Latest editions)

1. Indian Pharmacopoeia.
2. British pharmacopoeia.
3. National formularies(N.F.I.,B.N.P)
4. Remington's pharmaceutical sciences.
5. Martindale's Extra pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTRY II

THEORY (100 hours)

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic system containing up to 3 rings.
2. The chemistry of following pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties(chemical structure of only those compounds marked with asterisk (*). The stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants-Proflavine*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlophene, Nitrofurantoin.

Sulphonamides- Sulphadiazine, Sulphaguanidine, Phthalylsulphathaizole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxypyridazine, Co-trimoxazole, sulfacetamide*

Antileprotic Drugs- Clofazimine , Thiambutosine, Dapsone*, solapsone,

Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide*.

Antimoebic and Anthelmintic Drugs- Emetine, Metronidazole, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin , Piperazine*, Mebendazole ,D.E.C.*

Antibiotics- Benzyl penicillin*, Phenoxy methyl penicillin*, Benzathine penicillin, Ampicillin*, Cloxacillin, Carbencicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.

Antifungal agents- Udecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.

Antimalarial Drugs-Chloroquine*,Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.

Tranquilizers-Chlorpromazine*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperiodol*, Triperiodol, Oxypertine, Chlordizepoxide, Diazepam*, Lorazepam, Meprobamate.

Hypnotics- Phenobarbitone*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide*, Methyprylon, Paraldehyde, Triclofosodium.

General Anaesthetics-Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopecal sodium, Trichloroethylene .

Antidepressant Drugs- Amitriptyline, Nortryptyline, Imperamine*, Phepelzine, Tranylcypromine.

Analeptics- Theophylline, Caffeine*, Coramine*, Dextro-amphetamine.

Adrenergic drugs- Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrne*, Pseudoephedrine.

Adrenergic antagonist- Tolazoline, Propranolol*, Practolol.

Cholinergic Drugs- Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*. **Cholinergic Antagonists**- Atropine*, Hyoscine, Homatropine,

Propantheline*, Benztropine, Tropicamide, Biperiden*.

Diuretic Drugs- Furosemide*, Chlorothiazide, Hydrochlorothiazidc*, Benzthiazide, Urea*, Mannitol*, Ethacrynic Acid.

Cardiovascular Drugs- Ethylnitrite*, Glyceryl trinitrate, Alpha methyldopa, Guanethidine, Clofibrate, Quinidine.

Hypoglycemie Agents- Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin. **Coagulants and Anti coagulants**- Heparin, Thrombin, Menadione*, Bisphydroxy-coumarin, Warfarin sodium.

Local Anaesthetics- Lignocaine*, Procaine*, Benzocaine,

Histamine and anti Histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine*, Pheniramine, Chlorpheniramine*,

Analgesics and Anti-pyretics-Morphine, Pethidine, Codeine, Mathadone, Aspirin*, Paracetamol, Analgin, Dextropropoxphene, Pentazocine.

Non-steriodal anti-inflammatoryagents- Indomethacin*, Phenylbutazone*, Oxyphenbutazone, Ibuprofen.

Thyroxine and Antithyroids- Thyroxine*, Methimazole, Methyl thiouracil, Propylthiouracil.

Diagnostic Agents- Lopanoic Acid, Propyliodone, Sulfobromopthalein-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium.

Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins.

Steroidal Drugs- Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.

Anti-Neoplastic Drugs- Actinomycin, Azathioprie, Busulphan, Chloramubucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochoride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended: (Latest editions)

1. Pharmacopoeia of India.
2. British Pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

PRACTICAL (75 hours)

1. Systematic qualitative testing of organic drugs involving solubility determination, melting point and/or boiling point, detection of elements and functional groups (10 compounds).
2. Official identification tests for certain groups of drugs included in the I.P. like barbiturates, sulfonamides, Phenothiazines, Antibiotics etc.(8 compounds).
3. Preparation of three simple organic preparations.

2.3 PHARMACOLOGY & TOXICOLOGY

THEORY (75 hours)

Introduction to pharmacology, scope of pharmacology.

Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

General mechanism of drugs action and their factors which modify drugs action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspects:

Drugs acting on the central Nervous system:

General anaesthetics- adjunction to anaesthesia, intravenous anaesthetics. Analgesic antipyretics and non-steroidal
Anti-inflammatory drugs- Narcotic analgesics.
Antirheumatic and anti-gout remedies.
Sedatives and Hypnotics, psychopharmacological agents, anticonvulsants, analeptics. Centrally acting muscle relaxants and anti parkinsonism agents.
Local anesthetics.
Drugs acting on autonomic nervous system.
Cholinergic drugs, Anticholinergic drugs, anticholinesterase drugs. Adrenergic drugs and adrenergic receptor blockers.
Neurone blockers and ganglion blockers. Neuromuscular blockers, used in myasthenia gravis.
Drugs acting on eye: Mydriatics, drugs used in glaucoma.

Drugs acting on respiratory system
Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

Autocoids: physiological role of histamine and serotonin, Histamine and Antihistamines, prostaglandins.

Cardio vascular drugs
Cardiotonics, Antiarrhythmic agents, Anti-anginal agents, Antihypertensive agents, peripheral Vasodilators and drugs used in atherosclerosis.
Drugs acting on the blood and blood forming organs. Haematinics, coagulants and anticoagulants, Haemostatic , Blood substitutes and plasma expanders.

Drugs affecting renal function- Diuretics and anti-diuretics.

Hormones and hormone antagonists- Hypoglycemic agents, Anti--thyroid drugs, sex hormones and oral contraceptives , corticosteroids.

Drugs acting on digestive system-carminatives, digest ants, Bitters, Antacids and drugs used in peptic ulcer, purgatives ,and laxatives, Antidiarrohoeals, Emetics, Anti-emetics,

Antispasmodics.

Chemotherapy of microbial diseases:
Urinary antiseptics, sulphonamides, penicillin, streptomycin, Tetracyclines and other antibiotics. Anti- tubercular agents, Antifungal agents, antiviral drugs, anti-leprotic drugs. Chemotherapy of protozoal diseases, Anthelmintic
drugs. Chemotherapy of cancer.

Disinfectants and antiseptics.

PRACTICAL (50 hours)

1. The first six of the following experiments will be done by the students while
2. the remaining will be demonstrated by the teacher.
3. Effect of potassium and calcium ions, acetylcholine and adrenaline on frog's heart.
4. Effect of acetyl choline on rectus abdomens muscle of frog and guinea pig ileum.
5. Effect of spasmogens and relaxants on rabbits intestine.
6. Effect of local anaesthetics on rabbit cornea.
7. Effect of mydriatics and miotics on rabbit's eye.
8. To study the action of strychnine on frog.
9. Effect of digitalis on frog's heart.
10. Effect of hypnotics in mice.
11. Effect of convulsants and anticonvulsant in mice or rats.
12. Test for pyrogens.
13. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
14. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

2.4 PHARMACEUTICAL JURISPRUDENCE

THEORY (50 hours)

Origin and nature of pharmaceutical legislation in India, its scope and objectives. Evolution of the "Concept of pharmacy" as an integral part of the Health care system.

Principles and significance of professional Ethics. Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India.

Pharmacy Act,1948-The General study of the pharmacy Act with special reference to Education Regulations ,Working of state and central councils, constitution of these councils and functions, Registration procedures under the Act.

The Drugs and Cosmetics Act,1940-General study of the Drugs and cosmetics Act and the Rules there under. Definitions and salient features related to retail and whole sale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954-General study of the Act, objectives , special reference to be laid on Advertisements, magic remedies and objections1 and permitted advertisements -diseases which cannot be claimed to be cured.

Narcotic Drugs and psychotropic substances Act,1985-A brief study of the act with special reference to its objectives, offences and punishment.

Brief introduction to the study of the following acts:

Latest Drugs (price control) order in force. Poisons Act 1919(as amended to date)

Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date**).**

Medical Termination of Pregnancy Act, 1971(as amended to date).

Books recommended:(Latest editions)
Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

THEORY (75 hours)

Part I Commerce (50 hours)

Introduction-Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution.

Drug House Management-selection of site, space Lay-out and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto.Codification, handling of drug stores and other hospital supplies. Inventory Control-objects and importance, modern techniques like ABC,VED analysis, the lead time, inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal.

Sales promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

Recruitment, training, evaluation and compensation of the pharmacist.

Banking and Finance-Service and functions of bank, Finance planning and sources of finance.

Part II Accountancy (25 hours)

Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet.
Simple techniques of analyzing financial statements. Introduction to Budgeting.

Books Recommended: (Latest editions)

2.6 HOSPITAL AND CLINICAL PHARMACY

THEORY (75 hours)

Part-I: Hospital Pharmacy:

Hospital-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India.

Hospital Pharmacy: Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men.
Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists.
Drug Distribution system in Hospitals. Out-patient service,
In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.

Manufacturing: Economical considerations, estimation of demand.

Sterile manufacture-Large and small volume parenterals, facilities, requirements, layout production planning , man-power requirements.

Non-sterile manufacture-Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials.

Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories.
P.T.C.(pharmacy Therapeutic Committee)

Hospital Formulary system and their organization, functioning, composition.

Drug Information service and Drug Information Bulletin.

Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply eg. I.V.sets, B.G. sets, Ryals tubes, Catheters, Syringes etc
.
Application of computers in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital retail pharmacy establishment.

Part II: Clinical Pharmacy:

Introduction to Clinical pharmacy practice- Definition, scope.

Modern dispensing aspects- Pharmacists and patient counseling and advice for the use of common drugs, medication history.

Common daily terminology used in the practice of Medicine.

Disease, manifestation and patho-physiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

Physiological parameters with their significance.

Drug Interactions: Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction.
Adverse Drug Reaction: Definition and significance. Drug-Induced diseases and Teratogenicity.

Drugs in Clinical Toxicity- Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons.

Drug dependences, drug abuse, addictive drugs and their treatment, complications.

Bio-availability of drugs, including factors affecting it.

Books Recommended:(Latest editions)

1. Remington's pharmaceutical sciences.
2. Testing of raw materials used in (1).
3. Evaluation of surgical dressings.
4. Sterilization of surgical instruments, glassware and other hospital supplies.
5. Handling and use of data processing equipments.

ENVIRONMENTAL STUDIES

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various c o nt r o l measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

1. Introduction (04 Periods)
   - 1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)
   - 2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)
   - 3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD.

Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)
   - 4.1 Sources of soil pollution
   - 4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
   - 4.3 Effect of Solid waste
   - 4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)
   Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)
   Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)
   Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

BACHELOR OF PHARMACY
I, II, III & IV Year

On PCI Guidelines

(EFFECTIVE FROM THE SESSION: 2019-20)

Bachelor of Pharmacy (B. Pharm.)

COURSE OF STUDY & SCHEME OF EVALUATION FOR INTERNAL AND END SEMESTER EXAMINATIONS

(W.E.F. Session 2019-20)

FIRST SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Continuous Mode	Internal Assessment			End Semester Exams		Total Marks	Credit Points
				Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP101T	Human Anatomy and Physiology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP102T	Pharmaceutical Analysis I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP103T	Pharmaceutics I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP104T	Pharmaceutical Inorganic Chemistry– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP105T	Communication Skills – Theory	2	20	30	2 Hrs	50	---	---	50	2
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory	2	20	30	2 Hrs	50	---	---	50	2
BP107P	Human Anatomy and Physiology – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP108P	Pharmaceutical Analysis I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP109P	Pharmaceutics I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP110P	Pharmaceutical Inorganic Chemistry– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP111P	Communication Skills – Practical	2	10	15	2 Hrs	25	---	---	25	1
BP112RBP	Remedial Biology– Practical	2	10	15	2 Hrs	25	---	---	25	1
	Total	**38$/ 40#**	**110$/ 120#**	**175$/ 190#**	**26$/28# Hrs**	**285$/ 310#**	**440#**	**28# Hrs**	**725$/ 750#**	**29$/ 30#**

#Applicable ONLY for the students who have studied Mathematics/ Physics/ Chemistry at HSC and appearing for Remedial Biology (RB) course.

$Applicable ONLY for the students who have studied Physics/ Chemistry/ Botany/ Zoology at HSC and appearing for Remedial Mathematics (RM) course.

ECOND SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP201T	Human Anatomy and Physiology II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP203T	Biochemistry– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP204T	Pathophysiology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP205T	Computer Applications in Pharmacy– Theory	3	25	50	2 Hrs	75	---	---	75	3
BP206T	Environmental Sciences – Theory	3	25	50	2 Hrs	75	---	---	75	3
BP207P	Human Anatomy and Physiology II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP208P	Pharmaceutical Organic Chemistry I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP209P	Biochemistry– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP210P	Computer Applications in Pharmacy – Practical	2	10	15	2 Hrs	25	---	---	25	1
Total		**36**	**115**	**205**	**22 Hrs**	**320**	**405**	**24 Hrs**	**725**	**29**

THIRD SEMESTER*

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP301T	Pharmaceutical Organic Chemistry II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP302T	Physical Pharmaceutics I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP303T	Pharmaceutical Microbiology – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP304T	Pharmaceutical Engineering – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP306P	Physical Pharmaceutics I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP307P	Pharmaceutical Microbiology– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP308P	Pharmaceutical Engineering –Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
KVE301	Universal Human Values and Professional Ethics**	3	20	30	1 Hr	50	100	3 Hrs	150	3
Total		**35**	**80**	**130**	**21 Hrs**	**210**	**540**	**31 Hrs**	**750**	**27**

*The lateral entry students taking admission directly to second year shall compulsorily appear for and pass the Communications Skill Subject Examination in the Third Semester.

Human values & Professional Ethics will be offered as a **compulsory course for which passing marks shall be 30% in End Semester Examination and 40% in aggregate.

FOURTH SEMESTER*

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP401T	Pharmaceutical Organic Chemistry III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP402T	Medicinal Chemistry I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP403T	Physical Pharmaceutics II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP404T	Pharmacology I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP405T	Pharmacognosy I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP406P	Medicinal Chemistry I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP407P	Physical Pharmaceutics II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP408P	Pharmacology I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP409P	Pharmacognosy I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
Total		**36**	**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**	**28**

*The lateral entry students taking admission directly to second year shall compulsorily appear for and pass the Computer Applications in Pharmacy Subject Examination in the Fourth Semester.

FIFTH SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP501T	Medicinal Chemistry II – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP502T	Industrial Pharmacy I – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP503T	Pharmacology II – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP504T	Pharmacognosy and Phytochemistry	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP506P	Industrial Pharmacy I– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP507P	Pharmacology II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP509P	Report on Hospital Training-I	-	-	-	-	-	100	-	100	2
Total		**27**	**65**	**105**	**17 Hrs**	**170**	**580**	**27 Hrs**	**750**	**28**

SIXTH SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP601T	Medicinal Chemistry III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP602T	Pharmacology III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP603T	Herbal Drug Technology – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP605T	Pharmaceutical Biotechnology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP606T	Quality Assurance– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP607P	Medicinal Chemistry III – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP608P	Pharmacology III – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP609P	Herbal Drug Technology – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP610P	Report on Industrial Training	-	-	-	-	-	100	-	100	2
Total		**36**	**75**	**120**	**18 Hrs**	**195**	**655**	**30 Hrs**	**850**	**32**

SEVENTH SEMESTER

Course Code	Name of the Course	No. of Hours/week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP701T	Instrumental Methods of Analysis – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP702T	Industrial Pharmacy II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP703T	Pharmacy Practice – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP704T	Novel Drug Delivery System (NDDS) – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP705P	Instrumental Methods of Analysis/ NDDS – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP706PS	Practice School	12	50	100	5 Hrs	150	---	---	150	6
BP707P	Report on Hospital Training-II	-	-	-	-	-	100	-	100	2
Total		**32**	**95**	**170**	**13 Hrs**	**265**	**435**	**16 Hrs**	**700**	**26**

EIGHTH SEMESTER

Course Code	Name of the Course	No. of Hours/	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP801T	Biostatistics and Research Methodology	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP802T	Social and Preventive Pharmacy	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP803ET	Pharma Marketing Management*	4 + 4 = 8	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 =200	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science*									
BP805ET	Pharmacovigilance*									
BP806ET	Quality Control and Standardization of Herbal*									
BP807ET	Computer Aided Drug									
BP808ET	Cell and Molecular									
BP809ET	Cosmetic Science*									
BP810ET	Experimental									
BP811ET	Advanced Instrumentation Techniques*									
BP812ET	Dietary Supplements and Nutraceuticals*									
BP813ET	Pharmaceutical Product Development*									
BP814ET	LSSSDC Elective*									
BP815PW	Project Work **(On Elective)**	12	-	-	-	-	150	4 Hrs	150	6
BP816P	Report on Industrial Tour	-	-	-	-	-	100	-	100	2
	Total	**28**	**40**	**6**	**4 Hrs**	**10**	**550**	**16 Hrs**	**650**	**24**

*(ET: Elective subject) Every candidate has to **opt for two** of the elective subjects, and has to carry out **project on any one** of them.The student has the choice to choose both the elective subjects from the already prescribed list of elective subjects by the PCI **or** choose one elective subject from the existing prescribed list of elective subjects of B. Pharm. programme by the PCI and the other (second subject) elective from list of skill pack/modules available with the LSSSDC from time to time.

Semester I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

45 Hours

Course Content:

Unit-I **10 hours**

Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent; b) Paracrine; c) Synaptic; d) Endocrine.

Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit-II **10 hours**

Integumentary system: Structure and functions of skin.

Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction.

Joints: Structural and functional classification, types of joints movements and its articulation.

Unit-III **10 hours**

Body fluids and blood: Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo-endothelial system.

Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.

Unit-IV **08 hours**

Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Special senses: Structure and functions of eye, ear, nose and tongue and their disorders.

Unit-V **07 hours**

Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/weeks

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue.
3. Microscopic study of muscular and nervous tissue.
4. Identification of axial bones.
5. Identification of appendicular bones.
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count.
8. Enumeration of total red blood corpuscles (RBC) count.
9. Determination of bleeding time.
10. Determination of clotting time.
11. Estimation of hemoglobin content.
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

- Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
- Physiological Basis of Medical Practice by Best and Tailor, Williams & Wilkins Co, Riverview, MI, USA.
- Textbook of Medical Physiology by Arthur C, Guyton and John, E. Hall, Miamisburg, Ohio, U.S.A.
- Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
- Human Anatomy and Physiology by Marieb E.N., Benzamin Cummings, Pearson Education Inc., San Francisco.
- Preventive and Social Medicine by Park K., Banarsidas Bhanot Publishers, Jabalpur.
- Anatomy and Physiology in Health and Illness by Ross & Wilson Churchill Livingstone, London.
- Essentials of Anatomy and Physiology by Seeley R.R., Stephens T.D. and Tate P. McGraw-Hill, New York.
- Health Education and Community Pharmacy by Parmar N.S., CBS Publishers, Delhi.
- Health Education and Community Pharmacy by Dandiya P.C., Zafer Z.Y.K., and Zafer A. Vallabh Prakashan, Delhi.
- Samson Wright's Applied Physiology by Keele C.A., Niel E. and Joels N., Oxford University Press, New York.
- Human Physiology - Volume 1 and 2 by Dr. C.C. Chatterjee, Academic Publishers, Kolkata.

BP102T. PHARMACEUTICAL ANALYSIS (Theory) 45 Hours

Course Content:

Unit-I **10 Hours**

Pharmaceutical analysis: Definition and scope.

i) Different techniques of analysis.

ii) Methods of expressing concentration.

iii) Primary and secondary standards.

iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate.

Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures.

Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

Unit-II **10 Hours**

Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves.

Non-aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl.

Unit-III **10 Hours**

Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajan's method, estimation of sodium chloride.

Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

Basic Principles, methods and application of diazotization titration.

Unit-IV **08 Hours**

Redox titrations: Concepts of oxidation and reduction, Types of redox titrations (Principles and applications).

Cerimetry, Iodimetry, Iodometry, Bromometry, Dichrometry and titration with potassium-iodate.

Unit-V **07 Hours**

Electrochemical methods of analysis:

Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.

Potentiometry- Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

Polarography - Principle, Ilkovic equation construction and working of dropping mercury electrode and rotating platinum electrode, applications.

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following:

(1) Chloride.

(2) Sulphate.

(3) Iron.

(4) Arsenic.

II Preparation and standardization of

(1) Sodium hydroxide.

(2) Sulphuric acid.

(3) Sodium thiosulfate.

(4) Potassium permanganate.

(5) Ceric ammonium sulphate.

III Assay of the following compounds along with Standardization of Titrant:

(1) Ammonium chloride by acid base titration.

(2) Ferrous sulphate by Cerimetry.

(3) Copper sulphate by Iodometry.

(4) Calcium gluconate by Complexometry.

(5) Hydrogen peroxide by Permanganatometry.

(6) Sodium benzoate by non-aqueous titration.

(7) Sodium Chloride by precipitation titration.

IV Determination of Normality by electro-analytical methods:

(1) Conductometric titration of strong acid against strong base.

(2) Conductometric titration of strong acid and weak acid against strong base.

(3) Potentiometric titration of strong acid against strong base.

Recommended Books: (Latest Editions)

- Vogel's Textbook of Quantitative Chemical Analysis by Mendham J., Denny R.C., Barnes J.D., Thomas M, Jeffery G.H., Pearson Education Asia.
- A Textbook of Pharmaceutical by Conners K.A., Wiley Inter-science.
- Practical Pharmaceutical Chemistry by Beckett A.H., and Stenlake J.B., Vol. I & II. Athlone Press, University of London.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- Quantitative Analysis by Alexeyev V., CBS Publishers & Distributors, New Delhi.
- The Pharmacopoeia of India, the Controller of Publications, Delhi.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.
- Analytical Chemistry Principles by John H. Kennedy, Cengage Learning, Delhi.

BP103T. PHARMACEUTICS-I (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions.

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

Unit-II **10 Hours**

Pharmaceutical calculations: Weights and measures– Imperial & Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages. Simple & compound powders– official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.

Unit-III **10 Hours**

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasic liquids:

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

Unit-IV **08 Hours**

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

Unit-V **07 Hours**

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi-solid dosage forms. Evaluation of semi-solid dosages forms.

BP109P. PHARMACEUTICS I (Practical)

3 Hours/week

1. Syrups

a) Syrup IP'66.
b) Compound syrup of Ferrous Phosphate BPC'68.

2. Elixirs

a) Piperazine citrate elixir.
b) Paracetamol pediatric elixir.

3. Linctus

a) Terpen Hydrate Linctus IP'66.
b) Iodine Throat Paint (Mandl's Paint).

4. Solutions

a) Strong solution of ammonium acetate.
b) Cresol with soap solution.
c) Lugol's solution.

5. Suspensions

a) Calamine lotion.
b) Magnesium Hydroxide mixture.
c) Aluminum Hydroxide gel.

6. Emulsions

a) Turpentine Liniment.
b) Liquid paraffin emulsion.

7. Powders and Granules

a) ORS powder (WHO).
b) Effervescent granules.
c) Dusting powder.
d) Divided powders.

8. Suppositories

a) Glycero -Gelatin suppository.
b) Coca butter suppository.
c) Zinc Oxide suppository.

9. Semisolids

a) Sulphur ointment.
b) Non staining-iodine ointment with methyl salicylate.
c) Carbopol gel.

10. Gargles and Mouthwashes

a) Iodine gargle.
b) Chlorhexidine mouthwash.

Recommended Books: (Latest Editions)

- Pharmaceutical Dosage Form and Drug Delivery System by H.C. Ansel et al., Lippincott Williams and Wilkins, New Delhi.
- Cooper and Gunn's Dispensing for Pharmaceutical Students by Carter S.J., CBS Publishers, New Delhi.
- A Practical Guide to Contemporary Pharmacy Practice by Judith E. Thompson, 1st ed., Lippincott Williams & Wilkins.
- Pharmaceutics, The Science & Dosage Form Design by M.E. Aulton, Churchill Livingstone, Edinburgh.
- Pharmacopoeia of India, The Controller of Publications, Delhi.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- United States Pharmacopoeia (National Formulary).
- Theory and Practice of Industrial Pharmacy by Lachman, Lea & Febiger Publisher, the University of Michigan.
- Remington. The Science and Practice of Pharmacy by Alfonso R. Gennaro, Lippincott Williams and Wilkins, New Delhi.
- Cooper and Gunn's Tutorial Pharmacy by Carter S.J., CBS Publications, New Delhi.
- Bentley's Textbook of Pharmaceutics by E.A. Rawlins, English Language Book Society, Elsevier Health Sciences, USA.
- Pharmaceutical Palletization Technology by Isaac Ghebre Sellassie, Marcel Dekker Inc., New York.
- Handbook of Pharmaceutical Granulation Technology, Marcel Dekker Inc., New York.
- Pharmaceutical Emulsions and Suspensions, Francoise Nieloud and Gilberte Marti-Mestres Marcel Dekker, INC, New York.
- Textbook of Pharmaceutics, Volume - I & II by Aulton M.E., Churchill Livingstone, London.
- Modern Dispensing Pharmacy by Jain N.K., 2nd Ed, PharmaMed Press, Hyderabad.
- Calculations for Pharmaceutical Practice by A. Winfiled and I. Edafiogho, Elsevier Churchill Livingstone, London.
- Elementary Pharmaceutical Calculations by Tripathi D.K., PharmaMed Press, Hyderabad.

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Impurities in pharmaceutical Substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.

General methods of preparation, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes.

Unit-II **10 Hours**

Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.

Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

Unit-III **10 Hours**

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. HCl.

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture.

Cathartics: Magnesium sulphate, Sodium orthophosphate Kaolin and Bentonite.

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations.

Unit-IV **08 Hours**

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartrate.

Hematinics: Ferrous sulphate*, Ferrous gluconate.

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333.

Astringents: Zinc Sulphate, Potash Alum.

Unit-V **07 Hours**

Radiopharmaceuticals: Radio activity, measurement of radioactivity, properties of α, β, γ radiations, half-life, radio isotopes and study of radio isotopes- Sodium iodide I^{131}, storage conditions, precautions & pharmaceutical application of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

I Limit tests for following ions

Limit test for Chlorides and Sulphates

Modified limit test for Chlorides and Sulphates

Limit test for Iron

Limit test for Heavy metals

Limit test for Lead

Limit test for Arsenic

II Identification test

Magnesium hydroxide

Ferrous sulphate

Sodium bicarbonate

Calcium gluconate

Copper sulphate

III Test for purity

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

Boric acid

Potash alum

Ferrous sulphate

Recommended Books (Latest Editions)

- Pharmacopoeia of India, the Controller of Publications, Delhi.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- United States Pharmacopoeia (National Formulary).
- Inorganic, Medicinal & Pharmaceutical Chemistry by Block J.H., Roche E., Soine, T. and Wilson, C., Lea & Febiger, Philadelphia.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry by Atherden L.M., Oxford University Press, London.
- Inorganic Chemistry by Miessler, G.L. and Tarr, D.A., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.
- Vogel's Qualitative Inorganic Analysis by Svehla, G. and Sivasankar, B. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.

- Pharmaceutical Inorganic Chemistry by Rao K.S. and Suresh C.V., PharmaMed Press, Hyderabad.
- Pharmaceutical Inorganic Chemistry: Theory and Practice by Chenchu Lakshmi, N.V., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.
- Inorganic Pharmaceutical Chemistry by M.L. Schroff, National Book Centre, Kolkata.

BP105T. COMMUNIUCATION SKILLS (Theory)

30 Hours

Course content:

Unit-I **07 Hours**

Communication Skills: Introduction, Definition, The Importance of Communication, the communication process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

Perspectives in communication: Introduction, Visual perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Unit-II **07 Hours**

Elements of communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

Communication styles: Introduction, The Communication Styles Matrix with example for each Direct communication style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

Unit-III **07 Hours**

Basic listening skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in difficult situations.

Effective written communication: Introduction, When and When Not to Use Written Communication- Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication.

Writing effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.

Unit-IV **05 Hours**

Interview skills: Purpose of an interview, Do's and Don'ts of an interview.

Giving presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery.

Unit-V **04 Hours**

Group discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

BP111P. COMMUNIUCATION SKILLS (Practical)

2 Hours / Week

Course content:

The following learning modules are to be conducted using words worth® English language lab software.

Basic communication covering the following topics
Meeting People.
Asking Questions.
Making Friends.
What did you do?
Do's and Don'ts.

Pronunciations covering the following topics
Pronunciation (Consonant Sounds).
Pronunciation and Nouns.
Pronunciation (Vowel Sounds).

Advanced Learning
Listening Comprehension / Direct and Indirect Speech.
Figures of Speech.
Effective Communication.
Writing Skills.
Effective Writing. Interview
Handling Skills.
E-Mail etiquette. Presentation Skills.

Recommended Books: (Latest Edition)

- Basic Communication Skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
- Communication Skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011.
- Organizational Behavior, Stephen P. Robbins, 1st Edition, Pearson, 2013.
- Brilliant- Communication Skills, Gill Hasson, 1st Edition, Pearson Life, 2011.
- The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013.
- Developing Your Influencing Skills, Deborah Dalley, Lois Burton, Margaret, Green hall,

1st Edition Universe of Learning Ltd., 2010.

- Communication Skills for Professionals, Konar Nira, 2nd Edition, New arrivals, PHI, 2011.
- Personality Development and Soft Skills, Barun K Mitra, 1st Edition, Oxford Press, 2011.
- Soft Skill for Everyone, Butter Field, 1st Edition, Cengage Learning India Pvt. Ltd., 2011.
- Soft Skills and Professional Communication, Francis Peters S.J., 1st Edition, McGraw Hill Education, 2011.
- Effective Communication, John Adair, 4th Edition, Pan MacMillan, 2009.
- Bringing Out the Best in People, Aubrey Daniels, 2nd Edition, McGraw Hill, 1999.

BP106RBT. REMEDIAL BIOLOGY (Theory)

30 Hours

Course content:

Unit-I **07 Hours**

Living world:

Definition and characters of living organisms.

Diversity in the living world.

Binomial nomenclature.

Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus.

Morphology of flowering plants

Morphology of different parts of flowering plants- Root, stem, inflorescence, flower, leaf, fruit, seed.

General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledons.

Unit-II **07 Hours**

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph, Human circulatory system, Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG.

Digestion and absorption: Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food.

Breathing and respiration: Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes.

Unit-III **07 Hours**

Excretory products and their elimination: Modes of excretion, Human excretory system-structure and function, Urine formation, Rennin angiotensin system.

Neural control and coordination: Definition and classification of nervous system, Structure of a neuron, Generation and conduction of nerve impulse, Structure of brain and spinal cord, Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata.

Chemical coordination and regulation: Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands

Human reproduction: Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle.

Unit-IV **05 Hours**

Plants and mineral nutrition: Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis: Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

Unit-V **04 Hours**

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development: Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

Cell - The unit of life: Structure and functions of cell and cell organelles. Cell division

Tissues: Definition, types of tissues, location and functions.

BP112RBP. REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology.
   a) Study of Microscope.
   b) Section cutting techniques.
   c) Mounting and staining.
   d) Permanent slide preparation.
2. Study of cell and its inclusions.
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications.
4. Detailed study of frog by using computer models.
5. Microscopic study and identification of tissues pertinent to Stem, Root, Leaf, seed, fruit and flower.
6. Identification of bones.
7. Determination of blood group.
8. Determination of blood pressure.
9. Determination of tidal volume.

Textbooks:

- Textbook of Biology by S. B. Gokhale.
- A Textbook of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books:

- A Textbook of Biology by B.V. Sreenivasa Naidu.
- A Textbook of Biology by Naidu and Murthy.
- Botany for Degree Students by A.C. Dutta.
- Outlines of Zoology by M. Ekambaranatha Ayyer and T.N. Ananthakrishnan.
- A Manual for Pharmaceutical Biology Practical by S.B. Gokhale and C.K. Kokate.

Recommended Books (Latest Edition):

- Practical Human Anatomy and Physiology by S.R. Kale and R.R. Kale.
- A Manual of Pharmaceutical Biology Practical by S.B. Gokhale, C.K. Kokate and S.P. Shrivastava.
- Biology Practical Manual According to National Core Curriculum Biology Forum of Karnataka by Prof. M.J.H. Shafi.

BP106RMT. REMEDIAL MATHEMATICS (Theory)

30 Hours

Course Content:

Unit-I **06 Hours**

Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics.

Logarithms: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function: Real Valued function, Classification of real valued functions.

Limits and continuity: Introduction, Limit of a function, Definition of limit of a function ($\in$ - δ definition), $\lim_{x \to a} \frac{x^n - a^n}{x - a} = n a^{n-1}$, $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$,

Unit-II **06 Hours**

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley-Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.

Unit-III **06 Hours**

Calculus Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n *w.r.t*x, where n is any rational number, Derivative of e^x,, Derivative of $\log_e x$, Derivative of a^x, Derivative of trigonometric functions from first principles **(without Proof)**, Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application.

Unit-IV **06 Hours**

Analytical Geometry

Introduction: Signs of the Coordinates, Distance formula.

Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line.

Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application.

Unit-V **06 Hours**

Differential Equations: Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations.

Laplace Transform: Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving chemical kinetics and Pharmacokinetics equations.

Recommended Books (Latest Edition)

- Differential Calculus by Shanthinarayan.
- Pharmaceutical Mathematics with Application to Pharmacy by Panchaksharappa Gowda D.H.
- Integral Calculus by Shanthinarayan.
- Higher Engineering Mathematics by Dr. B.S. Grewal.

Semester II

BP201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Course Content:

Unit-I **10 hours**

Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).

Unit II **06 hours**

Digestive system: Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Energetics: Formation and role of ATP, Creatinine Phosphate and BMR.

Unit-III **10 hours**

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration.

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system: Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit-IV **10 hours**

Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit-V **09 hours**

Reproductive system: Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition.

Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

BP207P. HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)

4 Hours/week

1. To study the integumentary and special senses using specimen, models, etc.
2. To study the nervous system using specimen, models, etc.
3. To study the endocrine system using specimen, models, etc.
4. To demonstrate the general neurological examination.
5. To demonstrate the function of olfactory nerve.
6. To examine the different types of taste.
7. To demonstrate the visual acuity.
8. To demonstrate the reflex activity.
9. Recording of body temperature.
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index.
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyzer.
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

- Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
- Best and Taylor's Physiological Basis of Medical Practice by Best, Charles Herbert, Taylor, Norman Burke, John Bernard, 12th edition; William and Wilkins, Baltimore.
- Textbook of Medical Physiology by Arthur C, Guyton and John. E. Hall. Miamisburg, Ohio, U.S.A.
- Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
- Pharmacotherapy- A Pathophysiological Approach by Dipiro J.L., Elsevier, Amsterdam.
- Human Anatomy, Regional & Applied Part I, II & III by Chaurasia B.D, CBS Publishers & Distributors, New Delhi.
- Anatomy and Physiology in Health and Illness by Ross and Wilson, Churchill Livingstone, London.
- Essentials of Anatomy and Physiology by Seeley R.R., Stephens T.D. and Tate, P., McGraw-Hill, New York.
- Human Physiology, Volume 1 and 2 by Dr. C.C. Chatterjee, Academic Publishers Kolkata.

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Theory)

45 Hours

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.

Unit-I **07 Hours**

Classification, Nomenclature and Isomerism: Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds). Structural isomerism in organic compounds.

Unit II **10 Hours**

Alkanes*, Alkenes* and Conjugated dienes*

sp^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, sp^2 hybridization in alkenes.

E_1 and E_2 reactions – Kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation and evidences. E_1 verses E_2 reactions, Factors affecting E_1 and E_2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti-Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.

Unit III **10 Hours**

Alkyl halides*

SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions.

Structure and uses of ethyl chloride, chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol.

Unit-IV **10 Hours**

Carbonyl compounds* (Aldehydes and ketones)

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanillin, Cinnamaldehyde.

Unit-V **08 Hours**

Carboxylic acids*: Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester.

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid.

Aliphatic amines*: Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine.

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Practical)

4 Hours / week

A. Systematic qualitative analysis of unknown organic compounds like
   1. Preliminary test: Color, odor, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test.
   3. Solubility test.
   4. Functional group test like Phenols, Amides/Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
   5. Melting point/Boiling point of organic compounds.
   6. Identification of the unknown compound from the literature using melting point/ boiling point.
   7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
   8. Minimum 5 unknown organic compounds to be analyzed systematically.

B. Preparation of suitable solid derivatives from organic compounds.

C. Construction of molecular models.

Recommended Books (Latest Editions)

- Organic Chemistry by Morrison R.T., Boyd R.N. and Bhattacharjee, S.K., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Organic Chemistry by I.L. Finar, Volume-I, Pearson Education Ltd, New Delhi.
- Organic Chemistry by Bruice P.Y. and Prasad, K.J.R., Dorling Kindersley (India) Pvt. Ltd, New Delhi.
- A Guidebook to Mechanism in Organic Chemistry by Peter Sykes, Longman Group Ltd., Noida.
- Strategic Applications of Named Reactions in Organic Chemistry by Laszlo Kurti and Barbara Czako, Elsevier Academic Press.
- Reaction and Reaction Mechanism by Ahluwalia/Chatwal, Narosa Publishing House, New Delhi.
- Organic Chemistry by Jain M.K., Sohan Lal Nagin Chand & Co, New Delhi.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Practical Organic Chemistry by Mann F.G, and Saunders, B.C., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Advanced Practical Organic Chemistry by N.K. Vishnoi, Vikas Publishing House Pvt. Ltd., Noida.
- Introduction to Organic Laboratory Techniques by Pavia, Lampman and Kriz, Cengage Learning, Delhi.

BP203T. BIOCHEMISTRY (Theory)

45 Hours

Course Content:

Unit-I **08 Hours**

Biomolecules: Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP.

Unit-II **10 Hours**

Carbohydrate metabolism:

Glycolysis- Pathway, energetics and significance.

Gluconeogenesis- Pathway and its significance.

Citric acid cycle- Pathway, energetics and significance.

HMP shunt and its significance- Glucose-6-Phosphate dehydrogenase (G6PD) deficiency.

Glycogen metabolism Pathways and glycogen storage diseases (GSD).

Hormonal regulation of blood glucose level and Diabetes mellitus.

Biological oxidation:

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation. Inhibitors ETC and oxidative phosphorylation/Uncouplers.

Unit-III **10 Hours**

Lipid metabolism: β-Oxidation of saturated fatty acid (Palmitic acid). Formation and utilization of ketone bodies; ketoacidosis. De novo synthesis of fatty acids (Palmitic acid).

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D.

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism: General reactions of amino acid metabolism. Transamination, deamination and decarboxylation, Urea cycle and its disorders. Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkaptonuria, Tyrosinemia).

Synthesis and significance of biological substances: 5-HT, melatonin, dopamine, noradrenaline, adrenaline.

Catabolism of heme; hyperbilirubinemia and jaundice.

Unit-IV **10 Hours**

Nucleic acid metabolism and genetic information transfer

Biosynthesis of purine and pyrimidine nucleotides.

Catabolism of purine nucleotides and Hyperuricemia and Gout disease.

Organization of mammalian genome.

Structure of DNA and RNA and their functions DNA replication (semi conservative model)

Transcription or RNA synthesis.

Genetic code, Translation or Protein synthesis and inhibitors.

07 Hours

Enzymes

Introduction, properties, nomenclature and IUBMB classification of enzymes.

Enzyme kinetics (Michaelis-Menten plot, Line-Weaver Burke plot) Enzyme inhibitors with examples.

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation.

Coenzymes: Structure and biochemical functions.

Therapeutic and diagnostic applications of enzymes and isoenzymes.

BP209P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch).
2. Identification tests for Proteins (Albumin and Casein).
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method).
4. Qualitative analysis of urine for abnormal constituents.
5. Determination of blood creatinine.
6. Determination of blood sugar.
7. Determination of serum total cholesterol.
8. Preparation of buffer solution and measurement of pH.
9. Study of enzymatic hydrolysis of starch.
10. Determination of Salivary amylase activity.
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

- Harper's Illustrated Biochemistry by Murray R.K. and Granner D.K., Lange Medical Publication.
- Lehninger Principles of Biochemistry by Nelson D.L. and Cox M.M., Macmillan Worth Publishers.
- Fundamentals of Biochemistry by Voet D., Voet J.G., Pratt C.W., John Wiley and Sons Inc.
- Lippincott's Illustrative Reviews: Biochemistry by Champe P.C., Harvey R.A., Ferrier D.R., Lippincott Williams and Wilkins.
- Principles and Techniques of Biochemistry and Molecular Biology- by Wilson K. and Walker J., Cambridge University Press.
- Bioorganic Chemistry: A Chemical Approach to Enzyme Action by Dugas H., Springer (India) Private Limited, New Delhi.
- Molecular Cell Biology by Lodish H., Berk A., Matsudiaira P., Kaiser C.A., Krieger M. and Scott M.P., W. H. Freeman and Company, New York.
- Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition), McGraw Hill, New Delhi.
- Outline of Biochemistry by Conn E.E. and Stumph P.K., John Wiley & Sons, New York.

- Biochemistry by Stryer L. and Berg J.M., W.H. Freeman and Company, New York.
- Textbook of Biochemistry by Harrow B. and Mazur A., W.B. Saunders Co., Philadelphia.
- Practical Biochemistry by Harold Varley. CBS Publishers and Distributors. New Delhi.
- Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
- Laboratory Manual in Biochemistry by Jayaraman J., Wiley Eastern Limited.
- Practical Manual to Biochemistry by Singh S.P., CBS Publisher, New Delhi.
- Modern Experimental Biochemistry by Boyer R.F., Dorling Kindersley (India) Pvt. Ltd.
- Comprehensive Viva and Practical Biochemistry by Deb A.C., New Centre Book Agency (P.) Ltd. London.
- Pharmaceutical Biochemistry by Vyas S.P. and Kohli D.V., CBS Publishers & Distributors, New Delhi.

BP204T. PATHOPHYSIOLOGY (THEORY)

45Hours

Course content:

Unit-I **10 Hours**

Basic principles of Cell injury and Adaptation:

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,** Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,** Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,** Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance.

Basic mechanism involved in the process of inflammation and repair:

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis.

Unit-II **10Hours**

Cardiovascular System:

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

Respiratory system: Asthma, Chronic obstructive airways diseases.

Renal system: Acute and chronic renal failure.

Unit-III **10Hours**

Hematological Diseases:

Iron deficiency, megaloblastic anemia (Vitamin B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia.

Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones.

Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system: Peptic Ulcer.

Unit-IV **8 Hours**

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.

Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout.

Principles of cancer: classification, etiology and pathogenesis of cancer.

Unit-V **7 Hours**

Infectious diseases: Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections.

Sexually transmitted diseases: AIDS, Syphilis, Gonorrhea.

Recommended Books (Latest Editions)

- Robbins & Cotran Pathologic Basis of Disease by Vinay Kumar, Abul K. Abas, Jon C. Aster; South Asia edition; India; Elsevier.
- Text book of Pathology by Harsh Mohan; 6th edition; India; Jaypee Publications.
- Goodman Gilman's The Pharmacological Basis of Therapeutics by Laurence B, Bruce C., Bjorn K. 12th edition; McGraw-Hill, New York.
- Best and Taylor's Physiological Basis of Medical Practice by Best, Charles Herbert, Taylor, Norman Burke, John Bernard, 12th edition; United States; William and Wilkins, Baltimore.
- Davidson's Principles and Practice of Medicine by Nicki R. College, Brian R. Walker, Stuart H. Ralston, 21st edition; London; ELBS/Churchill Livingstone.
- Textbook of Medical Physiology by Guyton A, John. E Hall; 12th edition; WB Saunders Company.
- Pharmacotherapy by Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey, A Pathophysiological Approach; 9th edition; London; McGraw Hill Medical.
- Basic Pathology by V. Kumar, R. S. Cotran and S. L. Robbins, 6th edition; Philadelphia; WB Saunders Company.
- Clinical Pharmacy and Therapeutics by Roger Walker, Clive Edwards, 3rd. edition; London; Churchill Livingstone Publication.

Recommended Journals

- The Journal of Pathology. ISSN: 1096-9896 (Online).
- The American Journal of Pathology. ISSN: 0002-9440.
- Pathology. 1465-3931 (Online).
- International Journal of Physiology, Pathophysiology and Pharmacology, ISSN: 1944-8171.
- Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

BP205T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hours (2 Hours/Week)

Course content:

Unit-I **06 hours**

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division.

Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.

Unit-II **06 hours**

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products.

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.

Unit-III **06 hours**

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring.

Diagnostic system. Lab-diagnostic System, Patient Monitoring System, Pharma Information System.

Unit-IV **06 hours**

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.

Unit-V **06 hours**

Computers as data analysis in Preclinical development:

Chromatographic dada analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
8. Creating invoice table using – MS Access.
9. Drug information storage and retrieval using MS Access.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended books (Latest edition):

- Computer Application in Pharmacy by William E. Fassett, Lea and Febiger, South Washington Square, USA, (215) 922-1330.
- Computer Application in Pharmaceutical Research and Development by Sean Ekins, Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.
- Bioinformatics (Concept, Skills and Applications) by S.C. Rastogi, CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi.
- Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath by Cary N. Prague – Wiley Dreamtech India (P) Ltd., New Delhi.

BP206T. ENVIRONMENTAL SCIENCES (Theory)

30 hours

Course content:

Unit-I **10hours**

The multidisciplinary nature of environmental studies.

Natural Resources.

Renewable and non-renewable resources: Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II **10hours**

Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit-III **10hours**

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

- Environmental Science by Singh, Y.K., New Age International Pvt. Publishers, Bangalore.
- Environmental Biology by Agarwal, K.C., 2001, Nidi Publ. Ltd. Bikaner.
- The Biodiversity of India by Bharucha Erach, Mapin Publishing Pvt. Ltd., Ahmedabad, India.
- Hazardous Waste Incineration by Brunner R.C., 1989, McGraw Hill Inc.
- Marine Pollution by Clark R.S., Clanderson Press Oxford.
- Environmental Encyclopedia, by Cunningham, W.P. Cooper, T.H., Gorhani, E. & Hepworth, M.T., Jaico Pub. House, Mumbai.
- Environmental Chemistry by De A.K., Wiley Eastern Ltd.
- Down of Earth, Centre for Science and Environment, Editor Sunita Narain.

SEMESTER III

BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained.

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

Unit-I **10 Hours**

Benzene and its derivatives

A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule.

B. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedel Crafts alkylation-reactivity, limitations, Friedel Crafts acylation.

C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction.

D. Structure and uses of DDT, Saccharin, BHC and Chloramine T.

Unit-II **10 Hours**

Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols.

Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts.

Aromatic Acids*– Acidity, effect of substituents on acidity and important reactions of benzoic acid.

Unit-III **10 Hours**

Fats and Oils

Fatty acids – reactions.

Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.

Analytical constants– Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value– significance and principle involved in their determination.

Unit-IV **08 Hours**

Polynuclear Hydrocarbons: Synthesis, reactions.

Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives.

Unit-V **07 Hours**

Cycloalkanes*

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only.

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

1. Experiments involving laboratory techniques:
   - Recrystallization.
   - Steam distillation.
2. Determination of following oil values (including standardization of reagents):
   - Acid value.
   - Saponification value.
   - Iodine value.
3. **Preparation of compounds**
   - Benzanilide/Phenyl benzoate/Acetanilide from Aniline/Phenol/Aniline by acylation reaction.
   - 2,4,6-tribromo aniline/para bromo acetanilide from Aniline.
   - Acetanilide by halogenation (Bromination) reaction.
   - 5-nitrosalicylic acid/meta di-nitrobenzene from salicylic acid/ nitro benzene by nitration reaction.
   - Benzoic acid from benzyl chloride by oxidation reaction.
   - Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
   - 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
   - Benzil from benzoin by oxidation reaction.
   - Dibenzal acetone from benzaldehyde by Claisen-Schmidt reaction.
   - Cinnammic acid from benzaldehyde by Perkin reaction.
   - *p*-Iodo benzoic acid from *p*-amino benzoic acid.

Recommended Books (Latest Editions)

- Organic Chemistry by Morrison R.T., Boyd R.N. and Bhattacharjee, S.K. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Organic Chemistry by Jonathan Clayden, Nick G. S. Warren. Oxford University Press, Oxford.
- Organic Chemistry by G. Marc Loudon, Oxford University Press, Oxford.
- Organic Chemistry by Francis A. Carey and Robert M. Giuliano, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Strategic Applications of Named Reactions in Organic Chemistry by Laszlo Kurti and Barbara Czako, Elsevier Academic Press.
- Organic Chemistry by I.L. Finar, Volume-I, Pearson Education Ltd, New Delhi.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.

- Practical Organic Chemistry by Mann F.G, and Saunders B.C., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Introduction to Organic Laboratory Techniques by Pavia, Lampman and Kriz, Cengage Learning, Delhi.
- Reaction and Reaction Mechanism by Ahluwalia/Chatwal, Narosa Publishing House, New Delhi.
- A Guidebook to Mechanism in Organic Chemistry by Sykes P., Longman Group Ltd, London.
- Organic Chemistry by Jain M.K., Sohan Lal Nagin Chand & Co, New Delhi.
- Textbook of Organic Chemistry by P.L. Soni, Sultan Chand & sons, New Delhi.

BP302T. PHYSICAL PHARMACEUTICS-I (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications.

Unit-II **10 Hours**

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapor pressure, sublimation critical point, eutectic mixtures, gases, aerosols– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications.

Unit-III **10 Hours**

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB scale, solubilization, detergency, adsorption at solid interface.

Unit-IV **08Hours**

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

Unit-V **07 Hours**

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

BP306P. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature.
2. Determination of pKa value by Half Neutralization/Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water.
4. Determination of Partition co- efficient of Iodine in CCl_4 and water.
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method.
6. Determination of surface tension of given liquids by drop count and drop weight method.
7. Determination of HLB number of a surfactant by saponification method.
8. Determination of Freundlich and Langmuir constants using activated char coal.
9. Determination of critical micellar concentration of surfactants.
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method.
11. Determination of stability constant and donor acceptor ratio of Cupric Glycine complex by pH titration method.

Recommended Books: (Latest Editions)

- Physical Pharmacy by Alfred Martin, Lippincott Williams and Wilkins, USA.
- Tutorial Pharmacy by Cooper and Gunn, CBS, New Delhi.
- Pharmaceutical Calculations by Stocklosam J., Lea & Febiger, Philadelphia.
- Pharmaceutical Dosage forms: Disperse systems by Lieberman H.A, Lachman C, Volume 3, Marcel Dekker Inc.
- Physical Pharmaceutics by Ramasamy C. and Manavalan R., PharmaMed Press, Hyderabad.
- Laboratory Manual of Physical Pharmaceutics by C.V.S. Subramanyam. J., Thimma Settee.
- Experimental Pharmaceutics by Eugene, Parott, Burgess Pub. Co., UK.
- Physical Pharmaceutics by C.V.S. Subramanyam. CBS Publication
- Textbook of Physical Pharmacy by Gaurav Jain & Roop K. Khar, Reed Elsevier India Pvt. Ltd., New Delhi.
- Physical Pharmaceutics by Shotton E & Ridgeway K, Oxford University Press, London.
- Essentials of Physical Pharmacy by D.V. Derle, BSP Book Pvt. Ltd., Hyderabad.
- Pharmaceutics: The Design and Manufacture of Medicines by Aulton M.E, Churchill Livingstone.

BP303T. PHARMACEUTICAL MICROBIOLOGY (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance.
Introduction to Prokaryotes and Eukaryotes.
Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).
Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

Unit-II **10 Hours**

Identification of bacteria using staining techniques (simple, Gram's &Acid-fast staining) and biochemical tests (IMViC).
Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous, radiation and mechanical method of sterilization.
Evaluation of the efficiency of sterilization methods.
Equipments employed in large scale sterilization.
Sterility indicators.

Unit-III **10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.
Classification and mode of action of disinfectants.
Factors influencing disinfection, antiseptics and their evaluation.
For bacteriostatic and bactericidal actions.
Evaluation of bactericidal & Bacteriostatic.
Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit-IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.
Principles and methods of different microbiological assay.
Methods for standardization of antibiotics, vitamins and amino acids.
Assessment of a new antibiotic.

Unit-V **07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

BP307P. PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid-fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

- Pharmaceutical Microbiology by W.B. Hugo and A.D. Russel: Blackwell Scientific Publications, Oxford London.
- Industrial Microbiology by Prescott and Dunn., 4th edition, CBS Publishers & Distributors, Delhi.
- Microbiology by Pelczar and Chan Kreig, Tata McGraw Hill, New Delhi.
- Lippincott's Illustrated Reviews-Microbiology by Harvey, Champe and Fisher, Lippincott Williams and Wilkins, New Delhi.
- Principles and Practices of Contamination Control and Cleanrooms by C.K. Moorthy, Pharma Book Syndicate, Hyderabad.
- Pharmaceutical Microbiology by Malcolm Harris, Balliere Tindall and Cox., The Williams & Wilkins Co., NY.
- Fundamental Food Microbiology by Bibek Ray and Arun Bhunia, CRC Press, NY.
- Industrial Microbiology by Rose, Butterworths, USA.
- Fundamentals of Microbiology by Frobisher M., Hinsdill et al., 9th ed., Japan.
- Cooper and Gunn's Tutorial Pharmacy, CBS Publisher and Distribution.
- Microbial Technology by Peppler, Academic Press.
- I.P., B.P., U.S.P. - latest editions.
- Ananthnarayan and Paniker's Textbook of Microbiology, edited by C.K.J. Paniker, Orient-Longman, Hyderabad.
- Fundamentals of Microbiology by Edward, Benjamin Cummings, USA.

- Pharmaceutical Microbiology by N.K. Jain, Vallabh Prakashan, Delhi.
- Bergey's Manual of Systematic Bacteriology, Williams and Wilkins, Philadelphia.
- Disinfection and Sterilization- Theory and Practice, General and Industrial Chemistry Series by Sykes G., E & F.N. Spon Ltd., London.
- General Microbiology by Stanier R.Y., Ingraham, J.L., Wheelis M.L., Painter P.R., Macmillan Press Limited, London.
- Microbiology: An Introduction by Tortora, G.J., Funke, B.R. and Case, C.L., Pearson India Education Services Pvt. Ltd., Noida.
- Pharmaceutical Dosage Forms: Parenteral Medications by Sandeep Nema, John D. Ludwig, Informa Healthcare.

BP304T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Flow of Fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturi meter, Pitot tube and Rotameter.

Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

Unit-II **10 Hours**

Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.

Unit-III **10 Hours**

Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

Unit-IV **08 Hours**

Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seitz filter.

Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

Unit-V **07 Hours**

Materials of pharmaceutical plant construction, corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and their prevention. Ferrous and non-ferrous metals, inorganic and organic non-metals, basic of material handling systems.

BP308P. PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – From wet and dry bulb temperatures- use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
11. Factors affecting rate of filtration and evaporation (Surface area, Concentration and Thickness/viscosity).
12. To study the effect of time on the rate of crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender.

Recommended Books: (Latest Editions):

- Introduction to Chemical Engineering b y Walter L. Badger & Julius Banchero, Tata McGraw Hills, New Delhi.
- Solid Phase Extraction, Principles, Techniques and Applications by Nigel J.K. Simpson- Latest edition.
- Pharmaceutical Engineering by K. Sambamurthy, New Age International (P) Ltd., New Delhi.
- Unit Operation of Chemical Engineering by McCabe Smith, McGraw Hills, New Delhi.
- Pharmaceutical Engineering Principles and Practices by C.V.S Subrahmanyam et al., Vallabh Prakashan, Delhi.
- Remington Practice of Pharmacy by Martin, Latest edition.
- Lachman/Lieberman's Theory and Practice of Industrial Pharmacy by Roop K. Khar, S.P. Vyas, F.J. Ahmad and G.K. Jain, CBS Publishers & Distributers Pvt. Ltd., New Delhi.

- Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Unit Operations by G.G. Brown, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Perry's Chemical Engineers' Handbook by R.H. Perry and D.W. Green, McGraw-Hill, USA.
- Aulton's Pharmaceutics: The Design and Manufacture of Medicines; 3rd edition, Churchill Livingstone, UK.
- Bentley's Textbook of Pharmaceutics edited by E.A. Rawlins, Reed Elsevier India Pvt. Ltd., New Delhi.
- Pharmaceutical Process Engineering by Anthony J. Hickey and David Ganderton, Vol-112, Drugs and Pharmaceutical Sciences, Marcel Dekker, Inc., USA.

KVE301. UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

30 Hours

Course Content:

UNIT-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family.

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-Astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Recommended books:

- A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R Sangal, G P. Bagaria, 2009.
- Energy & Equity by Ivan Illich, 1974, the Trinity Press, Worcester, and Harper Collins, USA.
- Small Is Beautiful: A Study of Economics As If People Mattered by E.F. Schumacher, 1973, Blond & Briggs, Britain.
- How the Other Half Dies by Sussan George, 1976, Penguin Press. Reprinted 1986, 1991.
- Limits to Growth – Club of Rome's report by Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Universe Books.
- Jeevan Vidya Ek Parichay by A. Nagraj, 1998, Divya Path Sansthan, Amarkantak.
- Science and Humanism by P.L. Dhar, RR Gaur, 1990, Commonwealth Publishers.
- Human Values by A.N. Tripathy, 2003, New Age International Publishers.
- How to Practice Natural Farming by Subhas Palekar, 2000, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
- Fundamentals of Ethics for Scientists & Engineers by E G Seebauer & Robert L. Berry, 2000, Oxford University Press.
- Engineering Ethics (including Human Values) by M Govindrajran, S Natrajan & V.S. Senthil Kumar, Eastern Economy Edition, Prentice Hall of India Ltd.
- Foundations of Ethics and Management by B.P. Banerjee, Excel Books.

SEMESTER IV

BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications.

Unit-I **10 Hours**

Stereo isomerism:

Optical isomerism– Optical activity, enantiomerism, diastereomerism, meso compounds.
Elements of symmetry, chiral and achiral molecules.
DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers.
Reactions of chiral molecules.
Racemic modification and resolution of racemic mixture.
Asymmetric synthesis: partial and absolute.

Unit-II **10 Hours**

Geometrical isomerism- Nomenclature of geometrical isomers (Cis-Trans, E-Z, Syn-Anti systems). Methods of determination of configuration of geometrical isomers.
Conformational isomerism in Ethane, n-Butane and Cyclohexane.
Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.
Stereospecific and stereoselective reactions.

Unit-III **10 Hours**

Heterocyclic compounds:

Nomenclature and classification
Synthesis, reactions and medicinal uses of following compounds/derivatives:
Pyrrole, Furan, and Thiophene.
Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene.

Unit-IV **8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives:
Pyrazole, Imidazole, Oxazole and Thiazole.
Pyridine, Quinoline, Isoquinoline, Acridine and Indole.
Basicity of Pyridine.
Synthesis and medicinal uses of Pyrimidine, Purine, Azepines and their derivatives.

Unit-V **07 Hours**

Reactions of synthetic importance

Metal hydrid reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensation.

Recommended Books (Latest Editions)

- Organic Chemistry by Morrison R.T. and Boyd R.N., Bhattacharjee S.K., 7th Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Organic Chemistry by Finar I.L., 6th Edition, Vol.-I, Dorling Kindersley (India) P v t . Ltd (Pearson Education).
- An Introduction to the Chemistry of Heterocyclic Compounds by Acheson R.M., 3rd Edition, Wiley (India) Pvt. Ltd.
- Organic Chemistry by Bruice P.Y., 3rd Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Organic Chemistry by Francis A. Carey and Robert M. Giuliano, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Strategic Applications of Named Reactions in Organic Chemistry by Laszlo Kurti and Barbara Czako, Elsevier Academic Press.
- Heterocyclic Chemistry by Gilchrist T.L., Pearson Education (Singapore) Ltd.
- Heterocyclic Chemistry by Bansal R.K., New Age International Publishers.
- A Textbook of Organic Chemistry by Jain M.K. and Sharma S.C., Shoban Lal and Co. Educational Publishers.
- The Chemistry of Organic Medicinal Products by Jenkins G.L., Hartung W.H., Hamlin K.E. and Data J.B., 4th Edition, PharmaMed Press, Hyderabad.

BP402T. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*).

Unit-I **10 Hours**

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

Unit-II **10 Hours**

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.

Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metipranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

Unit-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathion, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

Unit-IV **08 Hours**

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturates: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital.

Miscellaneous: Amides & imides: Glutethimide.

Alcohol & their carbamate derivatives: Meprobamate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazines: SAR of Phenothiazines- Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluoro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpiride.

C. Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsant action.

Barbiturates: Phenobarbitone, Metharbital.

Hydantoins: Phenytoin*, Mephenytoin, Ethotoin.

Oxazolidine diones: Trimethadione, Paramethadione.

Succinimides: Phensuximide, Methsuximide, Ethosuximide.*

Urea and monoacylureas: Phenacemide, Carbamazepine.*

Benzodiazepines: Clonazepam.

Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate.

Unit-V **07 Hours**

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra-short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride. *

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anileridine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartrate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartrate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

BP406P. MEDICINAL CHEMISTRY – I (Practical)

4 Hours/week

I. Preparation of drugs/ intermediates

1 1,3-pyrazole
2 1,3-oxazole
3 Benzimidazole
4 Benzotriazole
5 2,3- diphenyl quinoxaline
6 Benzocaine
7 Phenytoin
8 Phenothiazine
9 Barbiturate

II. Assay of drugs

1 Chlorpromazine
2 Phenobarbitone
3 Atropine
4 Ibuprofen
5 Aspirin
6 Furosemide

III Determination of Partition coefficient for any two drugs

Recommended Books (Latest Editions)

- Wilson and Gisvold's Organic Medicinal and Pharmaceutical Chemistry by Block J.H. and Beale J.M., Lippincott Williams and Wilkins.
- Foye's Principles of Medicinal Chemistry by Lemke T.L., Williams D.A., Roche V.F. and Zito S.W., Lippincott Williams and Wilkins.
- Burger's Medicinal Chemistry and Drug Discovery by Abraham D.J., Vol I to IV. John Wiley and Sons Inc., New York.
- Synthesis of Essential Drugs by Vardanyan R.S. and Hruby V.J., Elsevier.
- Medicinal and Pharmaceutical Chemistry by Singh H. and Kapoor V.K., Vallabh Prakashan, Delhi.
- An Introduction to Medicinal Chemistry by Patrick Graham L., Oxford University Press.
- Medicinal Chemistry: A Biochemical Approach by Nogrady T., Oxford University Press, New York.
- The Organic Chemistry of Drug Design and Drug Action by Silverman R.B., Elsevier.
- Essentials of Medicinal Chemistry by Korolkovas A., John Wiley and Sons Inc., New York.

- Textbook of Drug Design and Discovery by Larsen P.K., Liljefors T. and Madsen U., Taylor and Francis Inc.
- Practical Organic Chemistry by Mann F.G. and Saunders B.C., Orient Longman Limited.
- Vogel's Textbook of Practical Organic Chemistry by Furniss B.S., Hannaford A.J., Smith P.W.G. and Tatchell A. R., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.).
- The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
- Pharmacopoeia of India, the Controller of Publications, Delhi.
- The Chemistry of Organic Medicinal Products by Jenkins G.L., Hartung W.H., Hamlin K.E. and Data J.B., PharmaMed Press Hyderabad.

BP403T. PHYSICAL PHARMACEUTICS-II (Theory)

45 Hours

Course Content:

Unit-I **07 Hours**

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action.

Unit-II **10 Hour**

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers.

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus.

Unit-III **10 Hours**

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions. Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

Unit-IV **10 Hours**

Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

Unit-V **8 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order.

Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.

BP407P. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method.
2. Determination of particle size, particle size distribution using Microscopic method.
3. Determination of bulk density, true densityand porosity.
4. Determine the angle of repose and influence of lubricant on angle of repose.
5. Determination of viscosity of liquid using Ostwald's viscometer.
6. Determination sedimentation volume with effect of different suspending agent.
7. Determination sedimentation volume with effect of different concentration of single suspending agent.
8. Determination of viscosity of semisolid by using Brookfield viscometer.
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order.
11. Accelerated stability studies.

Recommended Books: (Latest Editions)

- Physical Pharmacy by Alfred Martin, Lippincott Williams and Wilkins, USA.
- Experimental Pharmaceutics by Eugene, Parott, Burgess Pub. Co., UK.
- Pharmaceutical dosage forms: Disperse systems by Liberman H.A., Lachman C., Volume 1-3. Marcel Dekker Inc.
- Bentley's Textbook of Pharmaceutics edited by E.A. Rawlins, Reed Elsevier India Pvt. Ltd., New Delhi.
- Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems by Loyd V. Allen, Jr., N.G. Popovich and H. C. Ansel, Lippincott Williams & Wilkins, USA.
- Lachman/Lieberman's Theory and practice of industrial pharmacy by Roop K. Khar, S.P. Vyas, F.J. Ahmad and G.K. Jain, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Cooper and Gunn's Tutorial Pharmacy edited by S.J. Carter, CBS Publishers & Distributers Pvt. Ltd., New Delhi.

BP404T. PHARMACOLOGY-I (Theory)

45 Hours

Course Content:

Unit-I **08 hours**

General Pharmacology

Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and noncompetitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination.

Unit-II **12 Hours**

General Pharmacology

Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.

Adverse drug reactions.

Drug interactions (pharmacokinetic and pharmacodynamic).

Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

Unit-III **10 Hours**

Pharmacology of drugs acting on peripheral nervous system

Organization and function of ANS.

Neurohumoral transmission, co-transmission and classification of neurotransmitters.

Parasympathomimetic, Parasympatholytic, Sympathomimetics, sympatholytic.

Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

Local anesthetic agents.

Drugs used in myasthenia gravis and glaucoma.

Unit-IV **08 Hours**

Pharmacology of drugs acting on central nervous system

Neurohumoral transmission in the CNS special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.

General anesthetics and pre-anesthetics**.**
Sedatives, hypnotics and centrally acting muscle relaxants.
Anti-epileptics.
Alcohols and disulfiram.

Unit-V **07 Hours**

Pharmacology of drugs acting on central nervous system

Psychopharmacological agents: antipsychotics, antidepressants, anti-anxiety agents, antimanics and hallucinogens.
Drugs used in Parkinson's disease and Alzheimer's disease.
CNS stimulants and nootropics.
Opioid analgesics and antagonists.
Drug addiction, drug abuse, tolerance and dependence.

BP408P. PHARMACOLOGY-I (Practical)

4Hours/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus.
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using Rota-rod apparatus.
11. Effect of drugs on locomotor activity using Actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods.

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software and videos.

Recommended Books (Latest Editions)

- Rang and Dale's Pharmacology by Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Churchill Livingstone Elsevier.
- Basic and Clinical Pharmacology by Katzung B. G., Masters S. B., Trevor A. J., Tata McGraw-Hill.
- The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.
- Applied Therapeutics: The Clinical use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., the Point Lippincott Williams & Wilkins.
- Lippincott's Illustrated Reviews- Pharmacology by Mycek M.J., Gelnet S.B. and Perper M.M.
- Essentials of Medical Pharmacology by K.D. Tripathi, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
- Principles of Pharmacology by Sharma H. L., Sharma K. K., Paras medical publisher
- Modern Pharmacology with Clinical Applications, by Charles R. Craig & Robert.
- Fundamentals of Experimental Pharmacology by Ghosh M.N., Hilton & Company, Kolkata.
- Handbook of Experimental Pharmacology by Kulkarni S.K., Vallabh Prakashan.

BP405T. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Introduction to Pharmacognosy:

Definition, history, scope and development of Pharmacognosy.

Sources of Drugs – Plants, Animals, Marine & Tissue culture.

Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilage, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs.

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leaf constant, camera lucida and diagrams of microscopic objects to scale with camera lucida.

Unit-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin: Cultivation and Collection of drugs of natural origin. Factors influencing cultivation of medicinal plants. Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants.

Conservation of medicinal plants.

Unit-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.

Edible vaccines.

Unit-IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins.

Unit-V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs.

Plant Products:

Fibers - Cotton, Jute, Hemp.

Hallucinogens, Teratogens, Natural allergens.

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey.

Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids (Waxes, fats, fixed oils): Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax.

Marine Drugs: Novel medicinal agents from marine sources.

BP408P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests:
   (i) Tragacanth.
   (ii) Acacia.
   (iii) Gelatin.
   (iv) Starch.
   (v) Honey.
   (vi) Castor oil.
   (vii) Agar.
2. Determination of stomatal number and index.
3. Determination of vein islet number, vein islet termination and palisade ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer.
5. Determination of Fiber length and width.
6. Determination of number of starch grains by Lycopodium spore method.
7. Determination of Ash value.
8. Determination of Extractive values of crude drugs.
9. Determination of moisture content of crude drugs.
10. Determination of swelling index and foaming.

Recommended Books: (Latest Editions)

- Trease and Evans Pharmacognosy by W.C. Evans, 16th edition, W.B. Sounders & Co., London.
- Pharmacognosy by Tyler V.E., Brady L.R. and Robbers J.E., 9th Ed., Lea and Febiger, Philadelphia.
- Textbook of Pharmacognosy by Wallis T.E., CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Pharmacognosy and Phytochemistry by Mohammad Ali, CBS Publishers & Distribution, New Delhi.
- Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
- Herbal Drug Industry by R.D. Choudhary (1996), 1st Ed., Eastern Publisher, New Delhi.
- Essentials of Pharmacognosy, Dr. S.H. Ansari, 2nd Ed., Birla publications, New Delhi.
- Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhale, Vallabh Prakashan, Delhi.
- Pharmacognosy of Powdered Crude Drugs by M.A. Iyengar, PharmaMed Press, Hyderabad.

SEMESTER V

BP501T. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*).

Unit-I **10 Hours**

Antihistaminic agents: Histamine, receptors and their distribution in the human body.

H_1–antagonist: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamine succinate, Clemastine fumarate, Diphenylpyraline hydrochloride, Triphelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartrate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrizine Cromolyn sodium.

H_2-antagonists: Cimetidine*, Famotidine, Ranitidine.

Gastric proton-pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole.

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa.

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine.

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin.

Plant products: Etoposide, Vinblastine sulphate, Vincristine sulphate.

Miscellaneous: Cisplatin, Mitotane.

Unit-II **10 Hours**

Anti-anginal: Vasodilators: Amyl Nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics: Carbonic Anhydrase Inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop Diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol.

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril

hydrochloride, Quinapril Hydrochloride, Methyldopate Hydrochloride* Clonidine hydrochloride, Guanethidine Monosulphate, Guanabenz Acetate, Sodium Nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

Unit-III **10 Hours**

Anti-arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Disopyramide Phosphate*, Phenytoin Sodium, Lidocaine Hydrochloride, Tocainide Hydrochloride, Mexiletine Hydrochloride, Lorcainide Hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholestyramine and Colestipol.

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, Clopidogrel.

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

Unit-IV **08 Hours**

Drugs acting on Endocrine system: Nomenclature, Stereochemistry and metabolism of steroids.

Sex hormones: Testosterone, Andralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl Stilbestrol.

Drugs for erectile dysfunction: Sildenafil, Tadalafil.

Oral contraceptives: Mifepristone, Norgestrel, Levonorgestrel

Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone.

Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

Unit-V **07 Hours**

Antidiabetic agents: Insulin and its preparations.

Sulfonylureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone, Meglitinides, Repaglinide, Nateglinide.

Glucosidase inhibitors: Acarbose, Voglibose.

Local Anesthetics: SAR of Local anesthetics.

Benzoic acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine.

Recommended Books (Latest Editions)

- Wilson and Gisvold's Organic Medicinal and Pharmaceutical Chemistry by Block J.H. and Beale J.M., Lippincott Williams and Wilkins, NY.
- Foye's Principles of Medicinal Chemistry by Lemke T.L., Williams D.A., Roche V.F. and Zito S.W., Lippincott Williams and Wilkins.
- Burger's Medicinal Chemistry and Drug Discovery by Abraham D.J., Volume I to IV, John Wiley and Sons Inc., New York.
- Synthesis of Essential Drugs by Vardanyan R.S. and Hruby V.J., Elsevier.
- Introduction to Medicinal Chemistry by Alex Gringauz, Wiley VCH.
- An Introduction to Medicinal Chemistry by Patrick Graham L., Oxford University Press.
- Medicinal Chemistry: A Biochemical Approach by Nogrady T., Oxford University Press, New York.
- The Organic Chemistry of Drug Design and Drug Action by Silverman R.B., Elsevier.
- Introduction to Principles of Drug Design by Smith and Williams, CRC Press, US.
- Medicinal and Pharmaceutical Chemistry by Singh H. and Kapoor V.K., Vallabh Prakashan, Delhi.
- Textbook of Drug Design and Discovery by Larsen P.K., Liljefors T. and Madsen U., Taylor and Francis Inc.
- Martindale's Extra Pharmacopoeia.
- Organic Chemistry by I.L. Finar, Vol. II, Dorling Kindersley (India) Pvt. Ltd., Delhi.
- The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
- The Pharmacopoeia of India, the Controller of Publications, Delhi.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.

BP502T. INDUSTRIAL PHARMACY I (Theory)

45 Hours

Course content:

Unit-I **07 Hours**

Pre-formulation Studies: Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances.

Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism.

Chemical Properties: Hydrolysis, oxidation, reduction, racemization, polymerization.

BCS classification of drugs & its significance.

Application of pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

Unit-II **10 Hours**

Tablets:

Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment's and tablet tooling.

Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. Quality control tests: In process and finished product tests.

Liquid orals:

Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in Pharmacopoeia.

Unit-III **08 Hours**

Capsules:

Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, palletization process, and equipment for manufacture of pellets.

Unit-IV **10 Hours**

Parenteral Products:

Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity.

Production procedure, production facilities and controls, aseptic processing.

Formulation of injections, sterile powders, large volume parenteral and lyophilized products.

Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions, methods of preparation, labeling, containers, evaluation of ophthalmic preparations.

Unit-V **10 Hours**

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems, formulation and manufacture of aerosols, Evaluation of aerosols, Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

BP506P. INDUSTRIAL PHARMACY I (Practical)

4 Hours/week

1. Preformulation studies of Paracetamol/Aspirin/or any other drug.
2. Preparation and evaluation of Paracetamol tablets.
3. Preparation and evaluation of Aspirin tablets.
4. Coating of tablets- film coating of tables/granules.
5. Preparation and evaluation of Tetracycline capsules.
6. Preparation of Calcium Gluconate injection.
7. Preparation of Ascorbic Acid injection.
8. Quality control test of (as per IP) marketed tablets and capsules.
9. Preparation of Eye drops/ and Eye ointments.
10. Preparation of Creams (cold / vanishing cream).
11. Evaluation of glass containers (as per IP).

Recommended Books: (Latest Editions)

- Modern Pharmaceutics by Gilbert S. Banker; Christopher T. Rhodes, 4th edition; (Volume-121), Marcel Dekker, Inc., NY.
- Pharmaceutical Dosage Forms by Lieberman H.A., Lachman C., Parenteral Medications, Volume 1-3, Marcel Dekker Inc., USA.
- Pharmaceutical Dosage Forms by Lieberman H.A, Lachman C., Tablets, Volume 1-3, Marcel Dekker Inc., USA.
- Pharmaceutical Dosage Forms by Lieberman H.A, Lachman C., Disperse System, Volume 1-3, Marcel Dekker Inc., USA.
- The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS) by Remington.
- Lachman/Lieberman's Theory and Practice of Industrial Pharmacy by Roop K. Khar, S.P. Vyas, F.J. Ahmad and G.K. Jain, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Pharmaceutics-The Science of Dosage form Design by M.E. Aulton, Churchill Livingstone, Latest edition.
- Introduction to Pharmaceutical Dosage Forms by H.C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005.
- Drug stability- Principles and Practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.
- J. Swarbrick, J.C. Boylar, 2nd ed., Encyclopedia of Practical Technology, Vol. 1-3, 2004. (Updated supplement).

BP503T. PHARMACOLOGY-II (Theory) **45 Hours**

Course Content:

Unit-I **10 Hours**

Pharmacology of drugs acting on cardio-vascular system

Introduction to hemodynamic and electrophysiology of heart Drugs used in congestive heart failure.
Anti-hypertensive drugs.
Anti-anginal drugs.
Anti-arrhythmic drugs.
Anti-hyperlipidemic drugs.

Unit-II **10 Hours**

Pharmacology of drugs acting on cardio vascular system

Drug used in the therapy of shock.
Hematinics, coagulants and anticoagulants.
Fibrinolytics and anti-platelet drugs.
Plasma volume expanders.

Pharmacology of drugs acting on urinary system

Diuretics.
Anti-diuretics.

Unit-III **10 Hours**

Autacoids and related drugs

Introduction to autacoids and classification of Histamine, 5-HT and their antagonists.
Prostaglandins, Thromboxanes and Leukotrienes.
Angiotensin, Bradykinin and Substance P.
Non-steroidal anti-inflammatory agents.
Antigout drugs, Anti rheumatic drugs.

Unit-IV **08 Hours**

Pharmacology of drugs acting on endocrine system

Basic concepts in endocrine pharmacology.
Anterior Pituitary hormones- analogues and their inhibitors.
Thyroid hormones- analogues and their inhibitors.
Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin D.
Insulin, Oral Hypoglycemic agents and glucagon. ACTH and corticosteroids.

Unit-V **07 Hours**

Pharmacology of drugs acting on endocrine system

Androgens and Anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus.

Bioassay

Principles and applications of bioassay. Types of bioassay.
Bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT.

BP507P. PHARMACOLOGY-II (Practical)

4Hours/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog *rectus abdominis* muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog *rectus abdominis* muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three-point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four-point bioassay.
11. Determination of PA_2 value of prazosin using rat anococcygeus muscle (by Schild plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytic using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by software and videos

Recommended Books (Latest Editions)

- Rang and Dale's Pharmacology by Rang H. P., Dale M. M., Ritter J. M., Flower R. J. Churchill Livingstone Elsevier.
- Basic and Clinical Pharmacology by Katzung B. G., Masters S. B., Trevor A. J., Tata McGraw-Hill.
- The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.
- Applied Therapeutics: The Clinical use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K.A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Lippincott Williams & Wilkins.
- Lippincott's Illustrated Reviews - Pharmacology by Mycek M.J, Gelnet S.B and Perper M.M.
- Essentials of Medical Pharmacology by K.D. Tripathi, Jaypee Brothers Medical Publishers, New Delhi.
- Principles of Pharmacology by Sharma H. L., Sharma K. K., Paras medical publisher.
- Modern Pharmacology with Clinical Applications by Charles R. Craig & Robert, Lippincott Williams & Wilkins, USA.
- Fundamentals of Experimental Pharmacology by Ghosh M.N., Hilton & Company.
- Handbook of Experimental Pharmacology by Kulkarni S.K., Vallabh Prakashan.

BP504T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

Course Content:

Unit-I **7 Hours**

Metabolic pathways in higher plants and their determination

Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

Unit-II **14 Hours**

General introduction, composition, chemistry & chemical classes, bio -sources, therapeutic uses and commercial applications of following secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium.

Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta.

Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis.

Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander.

Tannins: Catechu, Pterocarpus.

Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony.

Glycosides: Senna, Aloes, Bitter Almond.

Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, Taxus, carotenoids.

Unit-III **06 Hours**

Isolation, Identification and Analysis of Phytoconstituents.

Terpenoids: Menthol, Citral, Artemisin.

Glycosides: Glycyrhetinic acid & Rutin.

Alkaloids: Atropine, Quinine, Reserpine, Caffeine

Resins: Podophyllotoxin, Curcumin.

Unit-IV **10 Hours**

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine.

Unit-V **8 Hours**

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, Chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

BP508P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander.
2. Exercise involving isolation & detection of active principles:
   a. Caffeine - from tea dust.
   b. Diosgenin from Dioscorea.
   c. Atropine from Belladonna.
   d. Sennosides from Senna.
3. Separation of sugars by Paper chromatography.
4. TLC of herbal extract.
5. Distillation of volatile oils and detection of phytoconstituents by TLC.
6. Analysis of crude drugs by chemical tests:
   (i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh.

Recommended Books: (Latest Editions)

- Trease and Evans Pharmacognosy by W.C. Evans, 16th edition, W.B. Sounders & Co., London.
- Pharmacognosy and Phytochemistry by Mohammad Ali, CBS Publishers and Distribution.
- Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi.
- Herbal Drug Industry by R.D. Choudhary, 1st Ed, Eastern Publisher, New Delhi.
- Essentials of Pharmacognosy by Dr. S.H. Ansari, 2nd Ed, Birla publications, New Delhi.
- Herbal Cosmetics by H. Panda, Asia Pacific Business Press, Inc., New Delhi.
- Textbook of Industrial Pharmacognosy by A.N. Kalia, CBS Publishers, New Delhi.
- Plant Cell Biotechnology by R. Endress, Springer-Verlag, Berlin, 1994.
- Pharmacognosy & Pharmacobiotechnology by James Bobbers, Marilyn KS, VE Tylor.
- The Formulation and Preparation of Cosmetic, Fragrances and Flavors by Louis Appell, Micelle Press.
- The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS) by Remington.
- Textbook of Biotechnology by Vyas and Dixit, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Biosynthesis of Natural Products by Manitto P., Ellis Horwood Limited.

BP505T. PHARMACEUTICAL JURISPRUDENCE (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules.

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

Unit-II **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945

Detailed study of Schedule G, H, M, N, P, T, U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and restricted license. Offences and penalties.

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules– Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, licensing authorities, controlling authorities, Drugs Inspectors.

Unit-III **10 Hours**

Pharmacy Act-1948: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties.

Medicinal and Toilet Preparation Act-1955: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.

Narcotic Drugs and Psychotropic substances Act-1985 and Rules: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.

Unit-IV **08 Hours**

Study of Salient Features of Drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties.

Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSE guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties.

National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM).

Unit-V **07 Hours**

Pharmaceutical Legislations - A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee.

Code of Pharmaceutical ethics - Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath.

Medical Termination of Pregnancy Act

Right to Information Act

Introduction to Intellectual Property Rights (IPR)

Recommended books: (Latest Edition)

- Forensic Pharmacy by B. Suresh, Birla Publication Pvt. Ltd., Delhi.
- Textbook of Forensic Pharmacy by B.M. Mittal, Vallabh Prakashan, Delhi.
- Handbook of Drug Law by M.L. Mehra, the University Book Agency, Lucknow.
- A Textbook of Forensic Pharmacy by N.K. Jain, Vallabh Prakashan, Delhi.
- Drugs and Cosmetics Act/Rules, Govt. of India publications.
- Medicinal and Toilet Preparations Act 1955, Govt. of India Publications.
- Narcotic Drugs and Psychotropic Substances Act, Govt. of India Publications.
- Drugs and Magic Remedies Act, Govt. of India Publication.
- Bare Acts of the Laws.
- Intellectual Property Rights in Pharmaceutical Industry: Theory and Practice by B. Subba Rao and P.V. Appaji, PharmaMed Press, Hyderabad.

BP509P. HOSPITAL TRAINING-I

Training of students at a hospital establishment for a minimum duration of 45 days. The hospital training shall include: First aid (wound dressing, artificial respiration etc.), different routes of injection, study of patient observation charts, prescriptions and dispensing, simple diagnostic reports, etc.

May be performed at the end of the 4th semester.

SEMESTER VI

BP601T. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Antibiotics: Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

β-Lactam antibiotics: Penicillin, Cephalosporin, β-Lactamase inhibitors, Monobactams.

Aminoglycosides: Streptomycin, Neomycin, Kanamycin.

Tetracycline: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline.

Unit-II **10 Hours**

Antibiotics: Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarial: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunate, Artemether, Atovaquone.

Unit-III **10 Hours**

Anti-tubercular Agents:

Synthetic anti tubercular agents: Isoniazid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Ant-tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycin, Capreomycin sulphate.

Urinary tract anti-infective agents:

Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin.

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Ganciclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirdine, Ribavirin, Saquinavir, Indinavir, Ritonavir.

Unit-IV **08 Hours**

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconazole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate.*

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintic: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantel, Ivermectin.

Sulphonamides and Sulfones: Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxazole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

Unit-V **07 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammett's electronic parameter, Taft's steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial Chemistry: Solid phase and solution phase synthesis.

BP607P. MEDICINAL CHEMISTRY- III (Practical)

4 Hours/week

I Preparation of drugs and intermediates:

1 Sulphanilamide.
2 7-Hydroxy, 4-methyl coumarin.
3 Chlorobutanol.
4 Triphenyl imidazole.
5 Tolbutamide.
6 Hexamine.

II Assay of drugs:

1 Isonicotinic acid hydrazide.
2 Chloroquine.
3 Metronidazole.
4 Dapsone.
5 Chlorpheniramine maleate.
6 Benzyl penicillin.

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique.

IV Drawing structures and reactions using chem draw ®.

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinski's RO5).

Recommended Books (Latest Editions)

- Wilson and Gisvold's Organic Medicinal and Pharmaceutical Chemistry by Block J.H. and Beale J.M., Lippincott Williams and Wilkins.
- Foye's Principles of Medicinal Chemistry by Lemke T.L., Williams D.A., Roche V.F. and Zito S.W., Lippincott Williams and Wilkins.
- Burger's Medicinal Chemistry and Drug Discovery by Abraham D.J., Vol I to IV. John Wiley and Sons Inc., New York.
- Synthesis of Essential Drugs by Vardanyan R.S. and Hruby V.J., Elsevier.
- Medicinal Chemistry: A Biochemical Approach by Nogrady T., Oxford University Press, New York.
- Textbook of Drug Design and Discovery edited by K. Stromgaard, P.V. Larsen and U. Madsen, CRC Press, NY.
- An Introduction to Medicinal Chemistry by Patrick Graham, L., Oxford University Press.
- The Organic Chemistry of Drug Design and Drug Action by Silverman R.B., Elsevier.
- Introduction to Principles of Drug Design by Smith and Williams.
- New Approaches to Drug Development edited by P. Jolles, Library of Congress Cataloging-in-Publication Data, Germany.

- Textbook of Drug Design and Discovery by Larsen P.K., Liljefors T. and Madsen U., Taylor and Francis Inc.

- Martindale's Extra Pharmacopoeia.
- The Organic Chemistry of Drug Design and Drug Action by Richard B. Silverman, Academic Press, USA.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Practical Organic Chemistry by Mann F.G, and Saunders, B.C., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
- The Pharmacopoeia of India, the Controller of Publications, Delhi.

BP602T. PHARMACOLOGY-III (Theory)

45 Hours

Course Content

Unit-I **10 hours**

Pharmacology of drugs acting on Respiratory system:

Anti-asthmatic drugs.

Drugs used in the management of COPD.

Expectorants and antitussives.

Nasal decongestants.

Respiratory stimulants.

Pharmacology of drugs acting on the Gastrointestinal Tract:

Antiulcer agents.

Drugs for constipation and diarrhoea.

Appetite stimulants and suppressants.

Digestants and carminatives.

Emetics and anti-emetics.

Unit-II **10 hours**

Chemotherapy: General principles of chemotherapy.

Sulfonamides and Cotrimoxazole.

Antibiotics- Penicillins, cephalosporin, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides.

Unit-III **10 hours**

Chemotherapy:

Antitubercular agents.

Antileprotic agents.

Antifungal agents.

Antiviral drugs.

Anthelmintics.

Antimalarial drugs.

Antiamoebic agents.

Unit-IV **08 hours**

Chemotherapy:

Urinary tract infections and sexually transmitted diseases.

Chemotherapy of malignancy.

Immunopharmacology:

Immunostimulants.

Immunosuppressant.

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars.

Unit-V **07 hours**

Principles of toxicology:

Definition and basic knowledge of acute, sub-acute and chronic toxicity.

Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity.

General principles of treatment of poisoning.

Clinical symptoms and management of barbiturates, morphine, and organophosphosphorus compound and lead, mercury and arsenic poisoning.

Chronopharmacology:

Definition of rhythm and cycles.

Biological clock and their significance leading to chronotherapy.

BP608P. PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments.
2. Anti-allergic activity by mast cell stabilization assay.
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility.
5. Effect of agonist and antagonists on guinea pig ileum.
6. Estimation of serum biochemical parameters by using semi-autoanalyzer.
7. Effect of saline purgative on frog intestine.
8. Insulin hypoglycemic effect in rabbit.
9. Test for pyrogens (rabbit method).
10. Determination of acute oral toxicity (LD50) of a drug from a given data.
11. Determination of acute skin irritation / corrosion of a test substance.
12. Determination of acute eye irritation / corrosion of a test substance.
13. Calculation of pharmacokinetic parameters from a given data.
14. Biostatistics methods in experimental pharmacology (student's t test, ANOVA).
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test).

**Experiments are demonstrated by simulated experiments/videos.*

Recommended Books (Latest Editions)

- Rang and Dale's Pharmacology by Rang H.P., Dale M.M., Ritter J.M., Flower R.J., Churchill Livingstone Elsevier.
- Basic and Clinical Pharmacology by Katzung B.G., Masters S.B., Trevor A.J., Tata McGraw-Hill.
- The Pharmacological Basis of Therapeutics by Goodman and Gilman's, McGraw Hill, USA.
- Applied Therapeutics: The Clinical Use of Drugs by Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., The Point Lippincott Williams & Wilkins.
- Lippincott's Illustrated Reviews- Pharmacology by Mycek M.J., Gelnet S.B. and Perper M.M.
- Essentials of Medical Pharmacology by K.D. Tripathi, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.
- Principles of Pharmacology, Sharma H.L., Sharma K.K., Paras Medical Publisher.
- Modern Pharmacology with Clinical Applications by Charles R. Craig & Robert.
- Fundamentals of Experimental Pharmacology by Ghosh M.N., Hilton & Company, Kolkata,
- Handbook of Experimental Pharmacology by Kulkarni S.K., Vallabh Prakashan,
- Concepts in Chronopharmacology by N. Udupa and P.D. Gupta.

BP603T. HERBAL DRUG TECHNOLOGY (Theory)

45 hours

Course content:

Unit-I **10 Hours**

Herbs as raw materials: Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Source of Herbs, Selection, identification and authentication of herbal materials, Processing of herbal raw material.

Biodynamic Agriculture: Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine: Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy. Preparation and standardization of Ayurvedic formulations *viz*. Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma.

Unit-II **8 Hours**

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.

Study of following herbs as health food: Alfa-alfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina.

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

Unit-III **10 Hours**

Herbal Cosmetics: Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients- colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes.

Unit-IV **10 Hours**

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs. Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products: Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy.

Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

Unit-V **07 Hours**

General Introduction to Herbal Industry: Herbal drugs industry: Present scope and future prospects. A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine:

Components of GMP (Schedule –T) and its objectives.

Infrastructural requirements working page, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

P609P. HERBAL DRUG TECHNOLOGY (Practical)

4 Hours/ week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista.
3. Evaluation of excipients of natural origin.
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias.
7. Determination of Aldehyde content.
8. Determination of Phenol content.
9. Determination of total alkaloids.

Recommended Books: (Latest Editions)

- Trease and Evans Pharmacognosy by W. C. Evans, 16th edition, W.B. Sounders & Co., London.
- Textbook of Industrial Pharmacognosy by A.N. Kalia, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Textbook of Pharmacognosy by Tyler, Brady & Robber, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Handbook of Cosmetic Science & Technology by M. Paye, A.D. Barel, H. Maibach, Informa Healthcare, NY.
- Cosmetics Formulation, Manufacture and QA by P.P. Sharma, 4th edition, Vandana Publication Pvt. Ltd.
- Poucher's Perfumes, Cosmetics and Soaps edited by Hilda Bulter, Springer (India) Pvt. Ltd., New Delhi.
- Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhale, Nirali Prakashan, New Delhi.
- Essential of Pharmacognosy by Dr. S.H. Ansari, Birla Publications Pvt. Ltd., Delhi.
- Pharmacopeial Standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy).
- Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals by Mukherjee, P.W. Business Horizons Publishers, New Delhi.

BP604T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Introduction to Biopharmaceutics:

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from non per-oral extra-vascular routes.

Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs.

Unit-II **10 Hours**

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs.

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

Unit-III **10 Hours**

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. Intravenous Injection (Bolus), Intravenous infusion and Extra vascular administrations. Pharmacokinetics parameters – K_E , t1/2,Vd, AUC, Ka, Clt and CL_R- definitions, methods of eliminations, understanding of their significance and application.

Unit-IV **08 Hours**

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

Unit-V **07 Hours**

Nonlinear Pharmacokinetics: Introduction, Factors causing Non-linearity. Michaelis-Menten method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

- Applied Biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew, B.C.Y.U. 4th edition Prentice-Hall International edition. USA.
- Biopharmaceutics and Pharmacokinetics-A Treatise by D.M. Brahmankar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi.
- Handbook of Clinical Pharmacokinetics by Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
- Biopharmaceutics by Swarbrick, Lea and Febiger, USA.
- Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, PharmaMed Press, Hyderabad.
- Textbook of Biopharmaceutics and Clinical Pharmacokinetics by Sarfaraz Niazi, PharmaMed Press, Hyderabad.
- Basic Pharmacokinetics by Mohsen A. Hedaya, CRC Press, NY.
- Biopharmaceutics and Pharmacokinetics by V. Ventashewarlu, PharmaMed Press, Hyderabad.
- Clinical Pharmacokinetics, Concepts and Applications by Malcolm Rowland and Thomas, N. Tozen, Lea and Febiger, Philadelphia, 1995.
- Dissolution, Bioavailability and Bioequivalence by Abdou H.M, Mack, Publishing Company, Pennsylvania, 1989.
- Biopharmaceutics and Clinical Pharmacokinetics: An Introduction by Robert F. Notari, 4th edition, Marcel Dekker Inc., New York.

BP605T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
Enzyme Biotechnology- Methods of enzyme immobilization and applications.
Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
Brief introduction to Protein Engineering.
Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
Basic principles of genetic engineering.

Unit-II **10 Hours**

Study of cloning vectors, restriction endonucleases and DNA ligase.
Recombinant DNA technology. Application of genetic engineering in medicine.
Application of r DNA technology and genetic engineering in the production of:

i) Interferon
ii) Vaccines- hepatitis- B
iii) Hormones-Insulin.

Brief introduction to PCR.

Unit-III **10 Hours**

Types of immunity- humoral immunity, cellular immunity.
Structure of Immunoglobulins.
Structure and Function of MHC.
Hypersensitivity reactions, Immune stimulation and Immune suppressions.
General method of the preparation of bacterial infections, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
Storage conditions and stability of official vaccines.
Hybridoma technology- Production, Purification and Applications, Blood products and Plasma Substitutes.

Unit-IV **08 Hours**

Immuno-blotting techniques- ELISA, Western blotting, Southern blotting.
Genetic organization of Eukaryotes and Prokaryotes.
Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
Introduction to Microbial biotransformation and applications.
Mutation: Types of mutation/mutants.

Unit-V **07 Hours**

Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.

Large scale production fermenter design and its various controls.

Study of the production of - Penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin.

Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

Recommended Books (Latest edition):

- Molecular Biotechnology: Principles and Applications of Recombinant DNA by B.R. Glick and J.J. Pasternak, ASM Press Washington D.C.
- Kuby Immunology by R.A. Goldsby *et. al.*, W.H. Freeman and Company, NY.
- Biotechnology by U. Satyanarayan, Books and allied Pvt. Ltd., Kolkata.
- Industrial Microbiology by L.E. Casida Jr., New Age International Pub., New Delhi.
- Crueger's Biotechnology- A textbook of Industrial Microbiology by Crueger and Aneja, Medtech, New Delhi.
- Monoclonal Antibodies by J.W. Goding, Academic Press.
- Molecular Biology and Biotechnology by J.M. Walker and E.B. Gingold, Royal Society of Chemistry.
- Immobilized Enzymes by Zaborsky, CRC Press, Ohio.
- Molecular Biotechnology by S.B. Primrose, Blackwell Scientific Publication.
- Principles of Fermentation Technology by Stanbury F.P., Whitakar A., and Hall J.S., 2nd ed., Aditya books Ltd., New Delhi.
- Pharmaceutical Biotechnology: Concepts and Applications by G. Walsh, Wiley and Sons Pvt. Ltd., USA.
- Pharmaceutical Biotechnology: Biochemistry and Biotechnology by G. Walsh, Wiley and Sons Pvt. Ltd., USA.

BP606T. PHARMACEUTICAL QUALITY ASSURANCE (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP.

Total Quality Management (TQM): Definition, elements, philosophies.

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines.

Quality by design (QbD): Definition, overview, elements of QbD program, tools.

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration.

NABL accreditation: Principles and procedures.

Unit-II **10 Hours**

Organization and personnel: Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

Unit-III **10 Hours**

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities.

Unit-IV **08 Hours**

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Unit-V **07 Hours**

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management.

Recommended Books: (Latest Edition)

- Quality Assurance Guide by Organization of Pharmaceutical Products of India.
- Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg, Vol. 69.
- Quality Assurance of Pharmaceuticals- A Compendium of Guidelines and Related Materials, Volume-I, WHO Publications.
- A Guide to Total Quality Management by Kushik Maitra and Sedhan K. Ghosh.
- How to Practice GMPs by P.P. Sharma, Vandana Publications Pvt. Ltd., Delhi.
- How to Practice GLP by P.P. Sharma, Vandana Publications Pvt. Ltd., Delhi.
- ISO 9000 and Total Quality Management by Sadhank G. Ghosh, Oxford Publishing House, UK.
- The International Pharmacopoeia – Volume I, II, III, IV- General Methods of Analysis and Quality Specification for Pharmaceutical Substances, Excipients and Dosage forms.
- Good Laboratory Practices by Marcel Dekker Series.
- ICH guidelines, ISO 9000 and 14000 guidelines.
- Quality Control of Packaging Materials in the Pharmaceutical Industry by Kenneth and Harburn, Marcel Dekker, Inc., NY.
- cGMP (Current Good Manufacturing Practices) for Pharmaceuticals, Manohar A. Potdar, PharmaMed Press, Hyderabad.
- Lachman/Lieberman's Theory and Practice of Industrial Pharmacy by Roop K. Khar, S.P. Vyas, F.J. Ahmad and G.K. Jain, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- N.K. Jain, Pharmaceutical Product Development, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Production and Operation Management by S.N. Chary, 3rd edition, Tata McGraw-Hill Education
- Concepts of Quality Management in Pharmaceutical Industry by Manohar A. Potdar, PharmaMed press, Hyderabad.
- Quality Assurance and Quality Management in Pharmaceutical Industry by Y. Anjaneyulu; R. Marayya, PharmaMed press.
- Pharmaceutical Quality Assurance and Quality management by Bhusari K.P; Shivhare U.D; Goupale D.C., PharmaMed press, Hyderabad.
- Modern Pharmaceutics by Gilbert S. Banker; Christopher T. Rhodes, 4th edition; (vol-121), Marcel Dekker, Inc., NY.
- Pharmaceutical Facilities: Design by Manohar. A. Potdar, Layout and Validation, 2nd edition; PharmaMed press, Hyderabad.
- Pharmaceutical Packaging Technology by V.K. Jain, D.C. Goupale, S. Nayak, PharmaMed press, Hyderabad.
- Quality Control & Total Quality Management by P.L. Jain, Tata McGraw Hill, New Delhi.

BP610P. REPORT ON INDUSTRIAL TRAINING

Training of students at an industrial establishment or an approved research laboratory. The industrial training shall include: in case of industry- different sections and subsections of the industry, an idea about the functioning of the industry, product range of the industry and various approvals of the industry; in case of research laboratory- different departments of the laboratory, an idea about the interdisciplinary coordination, contribution of the laboratory to the society and various approvals of the laboratory. A proper report of the same shall be submitted by the students, which shall be subsequently evaluated to assess the impact of the visit.

May be performed at the end of the 5th semester.

Semester VII

BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory)

45 Hours

Course Content:

Unit -I **10 Hours**

UV Visible spectroscopy: Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.
Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.
Applications- Spectrophotometric titrations, Single component and multi component analysis.
Fluorimetry: Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications.

Unit-II **10 Hours**

IR spectroscopy: Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations.
Instrumentation- Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications.
Flame Photometry- Principle, interferences, instrumentation and applications.
Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications.
Nephelo-turbidimetry- Principle, instrumentation and applications.

Unit-III **10 Hours**

Introduction to chromatography:
Adsorption and partition column chromatography- Methodology, advantages, disadvantages and applications.
Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.
Paper chromatography- Introduction, methodology, development techniques, advantages, disadvantages and applications.
Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications.

Unit-IV **08 Hours**

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications.
High performance liquid chromatography (HPLC)- Introduction, theory, instrumentation, advantages and applications.

Unit-V **07 Hours**

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications.
Gel chromatography- Introduction, theory, instrumentation and applications**.**
Affinity chromatography- Introduction, theory, instrumentation and applications.

BP705P. INSTRUMENTAL METHODS OF ANALYSIS / NDDS (Practical)

4 Hours/Week

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds.
2. Estimation of sulphanilamide by colorimetry.
3. Simultaneous estimation of ibuprofen and Paracetamol by UV spectroscopy.
4. Estimation of quinine sulphate by fluorimetry.
5. Study of quenching of fluorescence.
6. Determination of sodium by flame photometry.
7. Determination of potassium by flame photometry.
8. Determination of chlorides and sulphates by nephelo-turbidimetry.
9. Separation of sugars by thin layer chromatography.
10. Separation of plant pigments by column chromatography.
11. Demonstration experiment on HPLC.
12. Demonstration experiment on Gas Chromatography.
13. To perform in-vitro dissolution profile of CR/SR marketed formulation.
14. To prepare sustained release matrix tablets and evaluate by UV spectroscopy.
15. Formulation of nanoparticles and evaluate by HPLC.
16. Formulation and evaluation of liposomes.
17. To prepare buccal dosage form and evaluate by UV spectroscopy.
18. To prepare Paracetamol transdermal patch and evaluate by UV spectroscopy.

Recommended Books (Latest Editions)

- Instrumental Methods of Chemical Analysis by B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut, India.
- Organic Spectroscopy by Y.R Sharma, S. Chand & Company Ltd., New Delhi.
- Pharmaceutical Chemistry Instrumental Technique by Leslie G. Chatten, CBS Publisher and Distributer Pvt. Ltd., New Delhi.
- Textbook of Pharmaceutical Analysis by Kenneth A. Connors, John Wiley & Sons, Inc., New York.
- Vogel's Textbook of Quantitative Chemical Analysis by A.I. Vogel, Addison Wesley Logman, Singapore.
- Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Organic Spectroscopy by William Kemp, Palgrave, NY.
- Quantitative Analysis of Drugs by D.C. Garrett, Chapman & Hall Ltd., London.
- Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Spectrophotometric Identification of Organic Compounds by Silverstein, John Wiley & Sons, Inc., New York.
- Controlled and Novel Drug Delivery by N.K. Jain, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
- Novel Drug Delivery Systems by Y W. Chien, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York.

BP702T. INDUSTRIAL PHARMACY II (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Pilot plant scale up techniques: General considerations- including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology.

Unit-II **10 Hours**

Technology development and transfer: WHO guidelines for Technology Transfer (TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from RD to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE
/SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues.

Unit-III **10 Hours**

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals.

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Unit-IV **08 Hours**

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP.

Unit-V **07 Hours**

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

- Regulatory Affairs from Wikipedia, the Free Encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory Affairs.
- International Regulatory Affairs Updates, 2005, available at http://www.iraup.com/about.php.
- Textbook of FDA Regulatory Affairs. A Guide for Prescription Drugs, Medical Devices, and Biologics' by Douglas J Pisano and David S. Mantus.
- Regulatory Affairs brought by Learning Plus, Inc., available at http.//www.cgmp.com/ra.htm.
- Intellectual Property Rights in Pharmaceutical Industry Theory and Practice by Bayya Subba Rao and Appaji.
- How to Practice GLP by P.P. Sharma, Vandana Publications Pvt. Ltd., Delhi.
- Validation of Active Pharmaceuticals Ingredients by Ira R. Bony & Daniel Harpaz., CRC Press.
- Drugs and Pharmaceutical Sciences by Richard A. Guarina, 4th edition, Vol 139.

BP703T. PHARMACY PRACTICE (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Hospital and it's organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non-clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

Adverse drug reaction

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Unit-II **10 Hours**

Drug distribution system in a hospital

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labeling. Dispensing of drugs to ambulatory patients and dispensing of controlled drugs.

Hospital formulary

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

Therapeutic drug monitoring

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

Medication adherence

Causes of medication non-adherence, pharmacist role in the medication adherence and monitoring of patient medication adherence.

Patient medication history interview

Need for the patient medication history interview, medication interview forms.

Community pharmacy management

Financial, materials, staff, and infrastructure requirements.

Unit-III **10 Hours**

Pharmacy and therapeutic committee

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

Drug information services

Drug and Poison information centre, Sources of drug information, Computerized services, and storage and retrieval of information.

Patient counselling

Definition of patient counselling; steps involved in patient counselling, and Special cases that require the pharmacist

Education and training program in the hospital

Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills-communication with prescribers and patients.

Unit-IV **8 Hours**

Budget preparation and implementation: Budget preparation and implementation. **Clinical Pharmacy:** Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring- medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

Over the counter (OTC) sales: Introduction and sale of over the counter and rational use of common over the counter medications.

Unit-V **7 Hours**

Drug store management and inventory control

Organization of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure.

Investigational use of drugs

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

Interpretation of Clinical Laboratory Tests Blood chemistry, haematology and urine analysis.

Recommended Books (Latest Edition):

- A Textbook of Hospital Pharmacy by Merchant S.H. and Dr. J.S. Quadry, 4th ed. Ahmadabad: B.S. Shah Prakashan.
- A Textbook of Clinical Pharmacy Practice- Essential Concepts and Skills by Parthasarathi G., Karin Nyfort-Hansen, Milap C. Nahata, 1st ed. Chennai: Orient Longman Private Limited.
- Hospital Pharmacy by William E. Hassan, 5th ed. Philadelphia: Lea & Febiger; 1986.
- Hospital Pharmacy by Tipnis Bajaj, 1st ed. Maharashtra: Career Publications.
- Basic Skills in Interpreting Laboratory Data by Scott L.T., 4thed. American Society of Health System Pharmacists Inc.
- Health Education and Community Pharmacy by Parmar N.S. 18th ed. India: CBS Publishers & Distributers.

Journals:

- Therapeutic Drug Monitoring. ISSN: 0163-4356
- Journal of Pharmacy Practice. ISSN: 0974-8326
- American Journal of Health System Pharmacy. ISSN: 1535-2900 (Online)
- Pharmacy Times (Monthly Magazine)

BP704T. NOVEL DRUG DELIVERY SYSTEMS (NDDS) (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design-controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations.

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

Unit-II **10 Hours**

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications.

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion/mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems.

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implants and osmotic pump.

Unit-III **10 Hours**

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches.

Gastro-retentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS– Floating, high density systems, inflatable and gastro-adhesive systems and their applications.

Naso-pulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.

Unit-IV **08 Hours**

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.

Unit-V **07 Hours**

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome– Preliminary study, ocular formulations and ocuserts.

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications.

Recommended Books: (Latest Editions)

- Novel Drug Delivery Systems by Y W. Chien, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
- Controlled Drug Delivery Systems by Robinson, J. R., Lee V. H. L, Marcel Dekker, Inc., New York, 1992.
- Encyclopaedia of Controlled Drug Delivery by Edith Mathiowitz, Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim.
- Controlled and Novel Drug Delivery by N.K. Jain, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
- Controlled Drug Delivery-Concepts and Advances by S.P. Vyas and R.K. Khar, Vallabh Prakashan, New Delhi, First edition 2002.
- Modern Pharmaceutics by Gilbert S. Banker; Christopher T. Rhodes, 4th edition; (vol-121), Marcel Dekker, Inc., NY.
- Handbook of Pharmaceutical Controlled Release Technology by Donald L. Wise**,** Marcel & Dekker Inc., NY.
- Dermatological and Transdermal Formulations by Kenneth A. Walters**,** Mercell & Dekker Inc., NY.
- Drug Delivery System by Vasant V. Ranaday, Manffred A. Hollinger**,** CRC Press, NY.
- Design of Controlled Release Drug Delivery System by Xialing Li, Bhaskara R. Jasti**,** Mc-Graw Hill.

Journals

- Indian Journal of Pharmaceutical Sciences (IPA)
- Indian Drugs (IDMA)
- Journal of Controlled Release (Elsevier Sciences)
- Drug Development and Industrial Pharmacy (Marcel & Decker)
- International Journal of Pharmaceutics (Elsevier Sciences)

BP706PS. PRACTICE SCHOOL

150 Hours

Course content:

Every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains. Every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages).

Domains (anyone to be opted):

- Phytomedicine
- Formulation development
- Quality control and quality assurance
- Drug design and process chemistry
- Pharmaceutical software
- Artificial intelligence
- 3D printing
- Nutraceuticals
- Cosmeceuticals
- Alternative medicine

Recommended Books (Latest Editions)

- Trease and Evans Pharmacognosy by W. C. Evans, 16th edition, W.B. Sounders & Co., London.
- Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals by Mukherjee, P. W., Business Horizons Publishers, New Delhi, India, 2002.
- Current Concepts in Drug Design by T. Durai and Ananda Kumar, BSP Books.
- An Introduction to Medicinal Chemistry by Patrick Graham, L., Oxford University Press.
- Introduction to the Principles of Drug Design by Smith H.J., Williams H, Wright Boston.
- Industrial Microbiology by Prescott and Dunn, 4th edition, CBS Publishers & Distributors, Delhi.
- Molecular Biotechnology: Principles and Applications of Recombinant DNA by B.R. Glick and J.J. Pasternak: ASM Press Washington, D.C.
- Harry's Cosmetology by Wilkinson, Moore, Seventh Edition.
- Poucher's Perfumes, Cosmetic and Soaps by Poucher W.A., Butler, H., Springer India Pvt. Ltd, New Delhi.

BP707P. HOSPITAL TRAINING-II

Training of students at a hospital establishment for a minimum duration of 45 days. The hospital training shall include: First aid (wound dressing, artificial respiration etc.), different routes of injection, study of patient observation charts, prescriptions and dispensing, simple diagnostic reports etc.

May be performed at the end of the 6th semester.

SEMESTER VIII

BP801T. BIOSTATISITCS AND RESEARCH METHODOLOGY (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Introduction: Statistics, Biostatistics, Frequency distribution.

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples.

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems.

Correlation: Definition, Karl Pearson's coefficient of correlation, multiple correlation- Pharmaceuticals examples.

Unit-II **10 Hours**

Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical examples. **Probability:** Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties– problems.

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples.

Parametric test: t-test (Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference.

Unit-III **10 Hours**

Non-Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test.

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, Plagiarism.

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-IV **8 Hours**

Blocking and confounding system for Two-level factorials.

Regression modeling: Hypothesis testing in Simple and Multiple regression models

Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, Design of experiment, R- Online Statistical Software's to Industrial and Clinical trial approach.

Unit-V **7 Hours**

Design and Analysis of experiments:

Factorial Design: Definition, 2^2, 2^3design. Advantages of factorial design.

Response Surface methodology: Central composite design, Historical design, Optimization Techniques.

Recommended Books (Latest edition):

- Pharmaceutical Statistics- Practical and Clinical Applications by Sanford Bolton, Marcel Dekker Inc. New York.
- Fundamental of Statistics by S.C. Gupta, Himalaya Publishing House.
- Design and Analysis of Experiments by R. Pannerselvam, PHI Learning Private Limited.
- Design and Analysis of Experiments by Douglas and C. Montgomery, Wiley Students Edition.

BP802T. SOCIAL AND PREVENTIVE PHARMACY (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health.

Hygiene and health: personal hygiene and health care; avoidable habits.

Unit-II **10 Hours**

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.

Unit-III **10 Hours**

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Unit-IV **08 Hours**

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program.

Unit-V **07 Hours**

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Recommended Books (Latest edition):

- Short Textbook of Preventive and Social Medicine, G.N. Prabhakara, 2nd Edition, Jaypee Publications.
- Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, Japyee Publications.
- Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, Jaypee Publications.
- Essentials of Community Medicine A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, Jaypee Publications.
- Park Textbook of Preventive and Social Medicine, K. Park, 21st Edition, Banarasidas Bhanot Publishers.
- Community Pharmacy Practice by Ramesh Adepu, BSP publishers, Hyderabad.
- Sociology for Pharmacist by Kevin Taylor, Sarah Nettleton and Geoffery Harding.

Recommended Journals:

- Research in Social and Administrative Pharmacy, Elsevier, Ireland.

BP803ET. PHARMA MARKETING MANAGEMENT (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Marketing:

Definition, general concepts and scope of marketing, distinction between marketing & selling. Marketing environment. Industry and competitive analysis. Analyzing consumer buying behaviour and industrial buying behaviour.

Pharmaceutical market:

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation & targeting. Consumer profile; Motivation and prescribing habits of the physician; patient's choice of physician and retail pharmacist. Analysing the Market; Role of market research.

Unit-II **10 Hours**

Product decision:

Classification, product line and product mix decisions, product life cycle, product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

Unit-III **10 Hours**

Promotion:

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

Unit-IV **08 Hours**

Pharmaceutical marketing channels:

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Unit-V **07 Hours**

Pricing:

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:

Vertical & Horizontal Marketing; Rural Marketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

- Marketing Management by Philip Kotler and Kevin Lane Keller, Prentice Hall of India, New Delhi.
- Marketing Strategy- Planning and Implementation by Walker, Boyd and Larreche, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Organization and Management by R. D. Agarwal, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Marketing by Dhruv Grewal and Michael Levy, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Marketing Management by Arun Kumar and N. Meenakshi, Vikas Publishing, India.
- Marketing Management by Rajan Saxena, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Principles of Pharmaceutical Marketing edited by Mickey Smith, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Textbook of Forensic Pharmacy by B.M. Mittal, Vallabh Prakashan, Delhi.
- A textbook of Forensic Pharmacy by N.K. Jain, Vallabh Prakashan, Delhi.
- Marketing Management: Global Perspective, Indian Context by Ramaswamy, U.S & Nanakamari, S. Macmillan India, New Delhi.
- Service Marketing by Shanker, Ravi, Excel Books, New Delhi.
- Pharmaceutical Marketing in India (GIFT – Excel series) by Subba Rao Changanti Excel Publications.
- Salesmanship and Publicity by R.S. Daver, S.R. Davar and N.R. Davar, Vikas Publishing, India.
- Pharmaceutical Industrial Management by Vidya Sagar, PharmaMed Press, Hyderabad.
- Sales management: Decision, Strategies and Cases by R.S. Richard, C.W. Edward, G.A. Norman, Prentice-Hall of India Pvt. Ltd., New Delhi.
- Drugs and Cosmetics Act 1940 by Vijay Malik, EBC Publishing House Pvt. Ltd. Lucknow.

BP804ET. PHARMACEUTICAL REGULATORY SCIENCE (Theory)

45Hours

Course content:

Unit-I **10 Hours**

New Drug Discovery and development

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

Unit-II **10 Hours**

Regulatory Approval Process

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

Regulatory authorities and agencies

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications).

Unit-III **10 Hours**

Registration of Indian drug product in overseas market

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD)research.

Unit-IV **08 Hours**

Clinical trials

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials.

Unit-V **07 Hours**

Regulatory Concepts

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book.

Recommended books (Latest edition):

- Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
- The Pharmaceutical Regulatory Process (Drugs and the Pharmaceutical Sciences) 2nd edition by Ira R. Berry and Robert P. Martin, Vol. 185, Informa Health care Publishers.
- New Drug Approval Process: Accelerating Global Registrations by Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol. 190.
- Guidebook for Drug Regulatory Submissions by Sandy Weinberg, John Wiley & Sons. Inc., USA.
- FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, edited by Douglas J. Pisano, David Mantus.
- Generic Drug Product Development, Solid Oral Dosage forms by Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol. 143.
- Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance by Fay A. Rozovsky and Rodney K. Adams.
- Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene.
- Drugs: From Discovery to Approval by Rick Ng., 2nd Edition, Wiley-Blackwell.
- Intellectual Property Rights in Pharmaceutical Industry: Theory and Practice by B. Subba Rao and P.V. Appaji, PharmaMed Press, Hyderabad.
- Validation of Active Pharmaceuticals Ingredients by Ira R. Bony & Daniel Harpaz, CRC Press, US.

BP805ET. PHARMACOVIGILANCE (Theory)

45 hours

Course Content

Unit-I **10 Hours**

Introduction to Pharmacovigilance

History and development of Pharmacovigilance, Importance of safety monitoring of Medicine, WHO international drug monitoring programme, Pharmacovigilance Program of India (PvPI).

Introduction to adverse drug reactions

Definitions and classification of ADRs, Detection and reporting, Methods in Causality assessment, Severity and seriousness assessment, Predictability and preventability assessment, Management of adverse drug reactions.

Basic terminologies used in pharmacovigilance

Terminologies of adverse medication related events, Regulatory terminologies.

Unit-II **10 hours**

Drug and disease classification

Anatomical, therapeutic and chemical classification of drugs, International classification of diseases, Daily defined doses, International Non-proprietary names for drugs.

Drug dictionaries and coding in pharmacovigilance

WHO adverse reaction terminologies, MedDRA and Standardized MedDRA queries, WHO drug dictionary, EudraVigilance medicinal product dictionary.

Information resources in pharmacovigilance

Basic drug information resources, Specialized resources for ADRs.

Establishing pharmacovigilance programme

Establishing in a hospital, Establishment & operation of drug safety department in industry, Contract Research Organizations (CROs), Establishing a national program.

Unit-III **10 Hours**

Vaccine safety surveillance

Vaccine Pharmacovigilance, Vaccination failure, Adverse events following immunization.

Pharmacovigilance methods

Passive surveillance – Spontaneous reports and case series, Stimulated reporting, Active surveillance– Sentinel sites, drug event monitoring and registries. Comparative observational studies– Cross sectional study, case control study and cohort study. Targeted clinical investigations.

Communication in pharmacovigilance

Effective communication in Pharmacovigilance, Communication in Drug Safety Crisis management, Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media.

Unit-IV **8 Hours**

Safety data generation: Pre clinical phase, Clinical phase, Post approval phase (PMS).
ICH Guidelines for Pharmacovigilance: Organization and objectives of ICH**,** Expedited reporting**,** Individual case safety reports**,** Periodic safety update reports**,** Post approval expedited reporting**,** Pharmacovigilance planning**,** Good clinical practice in pharmacovigilance studies

Unit-V **7 Hours**

Pharmacogenomics of adverse drug reactions: Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population: Paediatrics**,** Pregnancy and lactation**,** Geriatrics.

CIOMS: CIOMS Working Groups, CIOMS Form.
CDSCO (India) and Pharmacovigilance: D & C Act and Schedule Y**,** Differences in Indian and global pharmacovigilance requirements.

Recommended Books (Latest edition):

- Textbook of Pharmacovigilance by S K Gupta, Jaypee Brothers, Medical Publishers.
- Quintessence of Pharmacovigilance by Tapan Kumar Chatterjee, PharmaMed Press.
- Practical Drug Safety from A to Z by Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
- Mann's Pharmacovigilance by Elizabeth B. Andrews, Nicholas, Wiley Publishers.
- Stephens' Detection of New Adverse Drug Reactions by John Talbot, Patrick Walle, Wiley Publishers.
- An Introduction to Pharmacovigilance by Patrick Waller, Wiley Publishers.
- Cobert's Manual of Drug Safety and Pharmacovigilance by Barton Cobert, Jones & Bartlett Publishers.
- Textbook of Pharmacoepidemiology edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Wiley Publishers.
- A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills by G. Parthasarathi, Karin Nyfort Hansen, Milap C. Nahata, Orient Longman Pvt Ltd.
- National Formulary of India.
- Textbook of Medicine by Yashpal Munjal.
- Textbook of Pharmacovigilance: Concept and Practice by G.P. Mohanta and P.K. Manna.
- http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn 3=7297
- http://www.ich.org/
- http://www.cioms.ch/
- http://cdsco.nic.in/
- http://www.who.int/vaccine_safety/en/
- http://www.ipc.gov.in/PvPI/pv_home.html

BP806ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)

45 Hours

Course Content

Unit-I **10 hours**

Basic tests for drugs– Pharmaceutical substances, Medicinal plants materials and dosage forms.

WHO guidelines for quality control of herbal drugs. Evaluation of commercial crude drugs intended for use.

Unit-II **10 hours**

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines WHO Guidelines on GACP for Medicinal Plants.

Unit-III **10 hours**

EU and ICH guidelines for quality control of herbal drugs.

Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines.

Unit-IV **08 hours**

Stability testing of herbal medicines. Application of various chromatographic techniques in standardization of herbal products.

Preparation of documents for new drug application and export registration GMP requirements and Drugs & Cosmetics Act provisions.

Unit-V **07 Hours**

Regulatory requirements for herbal medicines.

WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems

Comparison of various Herbal Pharmacopoeias.

Role of chemical and biological markers in standardization of herbal products.

Recommended Books: (Latest Editions)

- Trease and Evans Pharmacognosy by W. C. Evans, 16th edition, W.B. Sounders & Co., London.
- Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals by Mukherjee, P.W. Business Horizons Publishers, New Delhi, India, 2002.
- Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi.

- Textbook of Pharmacognosy and Phytochemistry, V.D. Rangari, Vol. I, Carrier Pub., 2006.
- Herbal Drug Technology by S.S. Aggarwal, Universities Press, 2012.
- EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products.
- Application of Quality Control Principles to Herbal Drugs by Shinde M.V., Dhalwal K., Potdar K., Mahadik K., International Journal of Phytomedicine 1(2009); p. 4-8.
- Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
- WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd Ed. World Health Organization, Geneva, 1981.
- WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
- WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 Vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
- WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

BP807ET. COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

Course Content:

UNIT-I **10 Hours**

Introduction to Drug Discovery and Development: Stages of drug discovery and development.

Lead discovery and Analogue Based Drug Design: Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analogue Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies.

UNIT-II **10 Hours**

Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Taft's steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III **10 Hours**

Molecular Modeling and virtual screening techniques:

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore-based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

UNIT-IV **08 Hours**

Informatics & Methods in drug design:

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V **07 Hours**

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics. Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions)

- Drug Action at the Molecular Level by Robert G.C.K., University Park Press, Baltimore.
- Quantitative Drug Design by Martin Y.C., Dekker, New York.
- Wilson & Gisvold's Text Book of Organic Medicinal & Pharmaceutical Chemistry by Delgado J.N., Remers W.A., Lippincott, New York.
- Principles of Medicinal chemistry by Foye WO, Lea & Febiger. Wolters Kliuwer Pvt. Ltd.
- Essentials of Medicinal Chemistry by Koro lkovas A., Burckhalter J.H., Wiley Interscience.
- The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry by Wolf M.E., John Wiley & Sons, New York.
- Current Concepts in Drug Design by T. Durai and Ananda Kumar, BSP Books, Hyderabad.
- An Introduction to Medicinal Chemistry by Patrick Graham, L., Oxford University Press.
- Introduction to the Principles of Drug Design by Smith H.J., Williams H., Wright Boston.
- Computer Aided Drug Design by P.J. Thomas and Propst C.L. Marcel Dekker Inc.NY. Essentials of Drug Design by Kothekar V, Dhruv Publications Delhi.
- Structure-Based Drug Discovery by J. Harren, and L Andrew, Springer (India) Pvt. Ltd., Delhi.
- Molecular Modelling and Design by Vinter J.V. and G. Mark, CRC Press, NY.
- The Organic Chemistry of Drug Design and Drug Action by Silverman R.B., Academic Press, New York

BP808ET. CELL AND MOLECULAR BIOLOGY (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Cell and Molecular Biology: Definitions theory and basics and Applications. Cell and Molecular Biology: History and Summation.
Properties of cells and cell membrane.
Prokaryotic versus Eukaryotic.
Cellular Reproduction.
Chemical Foundations – an Introduction and Reactions (Types).

Unit-II **10 Hours**

DNA and the Flow of Molecular Information. DNA Functioning.
DNA and RNA. Types of RNA. Transcription and Translation.

Unit-III **10 Hours**

Proteins: Defined and Amino Acids. Protein Structure.
Regularities in Protein Pathways.

Cellular Processes.
Positive Control and significance of Protein Synthesis.

Unit-IV **08 Hours**

Science of Genetics.
Transgenics and genomic analysis. Cell cycle analysis.
Mitosis and Meiosis.
Cellular Activities and checkpoints.

Unit-V **07 Hours**

Cell Signals: Introduction. Receptors for Cell Signals.
Signaling Pathways: Overview.
Misregulation of Signaling Pathways.
Protein-Kinases: Functioning.

Recommended Books (latest edition):

- Pharmaceutical Microbiology by W.B. Hugo and A.D. Russel, Blackwell Scientific publications, Oxford London.
- Industrial Microbiology by Prescott and Dunn., 4^{th} edition, CBS Publishers & Distributors, Delhi.
- Molecular Biotechnology: Principles and Applications of Recombinant DNA: by B.R. Glick and J.J. Pasternak, ASM Press Washington D.C.
- Microbiology by Pelczar, Chan Kreig, Tata McGraw Hill, New Delhi.
- Pharmaceutical Microbiology by Malcolm Harris, Balliere Tindall and Cox.
- Industrial Microbiology by Rose, Butterworths, USA.
- Fundamentals of Microbiology by Frobisher, Hinsdill et al, 9th ed. Japan.
- Cooper and Gunn's Tutorial Pharmacy by Carter S.J., CBS Publications, New Delhi.
- Microbial Technology by Peppler, Academic Press.
- Fundamentals of Microbiology by Edward, Benjamin Cummings, USA.
- Pharmaceutical Microbiology by N.K. Jain, Vallabh Prakashan, Delhi.
- Bergey's Manual of Systematic Bacteriology by Williams and Wilkins, A Waverly company.
- Kuby Immunology by R.A. Goldsby *et. al.,* W.H. Freeman and Company, NY.

BP809ET. COSMETIC SCIENCE (Theory)

45 Hours

Unit-I **10 Hours**

Classification of cosmetic and cosmeceutical products.

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs.

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums**.**

Unit-II **10 Hours**

Principles of formulation and building blocks of skin care products:

Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals.

Antiperspirants & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils.

Chemistry and formulation of para phenylenediamine based hair dye. Principles of formulation and building blocks of oral care products: Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

Unit-III **10 Hours**

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:

Skin Care: Aloe and turmeric.

Hair care: Henna and amla.

Oral care: Neem and clove.

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste**.**

Unit-IV **08 Hours**

Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Colour, Hair tensile strength, Hair combing properties.

Soaps and syndet bars. Evolution and skin benefits.

Unit-V **07 Hours**

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odour. Antiperspirants and Deodorants- Actives and mechanism of action.

Recommended Books (latest edition):

- Harry's Cosmetology by Wilkinson, Moore, Seventh Edition.
- Poucher's Perfumes, Cosmetics and Soaps edited by Hilda Bulter, Springer (India) Pvt. Ltd., New Delhi.
- Cosmetics Formulation, Manufacture and Quality Control by P.P. Sharma, 4th edition, Vandana Publication Pvt. Ltd., Delhi.
- Cosmetology by Sanju Nanda & Roop K. Khar, Publishers. Birla Publications Pvt Ltd.
- Cosmeceuticals by Madhusudan Rao, PharmaMed Press, Hyderabad.
- Cosmetics: Science and Technology by Balsam M.S., Sagarin, E., Wiley Interscience, New York.
- Handbook of Cosmetic Science and Technology by Pave M., Basel, A.O., Maibach H.I., Informa Healthcare, New York.
- Cosemeceuticals by Rao Y.N., Shayeda, PharmaMed Press, Hyderabad.
- Herbal Cosmetics by H. Panda, Asia Pacific Business Press, Inc., New Delhi.
- Drugs and Cosmetics Act/Rules, Govt. of India Publications.
- Drugs and Cosmetics Act 1940 by Vijay Malik, EBC Publishing House Pvt. Ltd. Lucknow.

BP810ET. PHARMACOLOGICAL SCREENING METHODS (Theory)

45 Hours

Course content:

Unit-I **10 Hours**

Laboratory Animals:

Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals.

Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.

Unit-II **10 Hours**

Preclinical screening models

Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study.

Study of screening animal models for:

Diuretics, nootropics, anti-Parkinson's, anti-asthmatics.

Preclinical screening models: for CNS activity- analgesic, antipyretic, anti- inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, Alzheimer's disease.

Unit-III **10 Hours**

Preclinical screening models: for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaesthetics.

Unit-IV **08 Hours**

Preclinical screening models: for CVS activity – anti-hypertensives, diuretics, antiarrhythmic, anti-dyslipidemic, anti-aggregatory, coagulants, and anticoagulants. Preclinical screening models for other important drugs like antiulcer, anti-diabetic, anticancer and anti-asthmatics.

Unit-V **07 Hours**

Research methodology and Bio-statistics:

Selection of research topic, review of literature, research hypothesis and study design. Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data.

Recommended Books (latest edition):

- Fundamentals of Experimental Pharmacology by M.N. Ghosh., Hilton and Company, Kolkata.
- Handbook of Experimental Pharmacology by S.K. Kulkarni, Vandana Prakashan Delhi.
- CPCSEA Guidelines for Laboratory Animal Facility.
- Drug Discovery and Evaluation by Vogel H.G., Springer Berlin, Germany.
- Screening Methods in Pharmacology by Turner, Elsevier a Division of Reed India Pvt. Ltd. Noida.
- Introduction to Biostatistics and Research Methods by P.S.S. Sundar Rao and J. Richard.

BP811ET. ADVANCED INSTRUMENTATION TECHNIQUES (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Nuclear Magnetic Resonance spectroscopy

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications.

Mass Spectrometry- Principles, Fragmentation, Ionization techniques- Electron impact, chemical ionization, MALDI, FAB, Analyzers -Time of flight and Quadrupole, instrumentation, applications.

Unit-II **10 Hours**

Thermal Methods of Analysis: Principles, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC).

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray Crystallography, rotating crystal technique, single crystal diffraction, powder diffraction, structural elucidation and applications.

Unit-III **10 Hours**

Calibration and validation- as per ICH and USFDA guidelines.

Calibration of following Instruments: Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer, Fluorimeter, Flame Photometer, HPLC and GC.

Unit-IV **08 Hours**

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immunoassay.

Extraction techniques: General principle and procedure involved in the solid phase extraction and liquid-liquid extraction.

Unit-V **07 Hours**

Hyphenated techniques- LC-MS/MS, GC-MS/MS, HPTLC-MS.

Recommended Books (Latest Editions)

- Instrumental Methods of Chemical Analysis by B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut, India.
- Organic Spectroscopy by Y.R. Sharma, S. Chand & Company Ltd., New Delhi.
- Pharmaceutical Chemistry Instrumental Technique by Leslie G. Chatten, CBS Publisher and Distributer Pvt. Ltd., New Delhi.
- Textbook of Pharmaceutical Analysis by Kenneth A. Connors, John Wiley & Sons, Inc., New York.
- Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Vogel's Textbook of Quantitative Chemical Analysis by A.I. Vogel, Addison Wesley Logman, Singapore.
- Quantitative Analysis of Drugs in Pharmaceutical Formulations by P.D. Sethi, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Quantitative Analysis of Drugs by D.C.Garrett, Chapman & Hall Ltd., London.
- Spectrophotometric Identification of Organic Compounds by Silverstein, John Wiley & Sons, Inc., New York.
- Organic Spectroscopy by William Kemp, Palgrave, NY.

BP812ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.

Public health nutrition, maternal and child nutrition. Nutrition and ageing, nutrition education in community.

Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soybean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds.

Unit-II **10 Hours**

Phytochemicals as nutraceuticals: Occurrence and characteristic features (chemical nature medicinal benefits) of following:

Carotenoids: α and β-Carotene, Lycopene, Xanthophylls, leutin.

Sulfides: Diallyl sulfides, Allyl trisulfide.

Polyphenolics: Reservetrol.

Flavonoids: Rutin, Naringin, Quercitin, Anthocyanidins, catechins, Flavones.

Prebiotics/Probiotics: Fructo-oligosaccharides, Lacto bacillum.

Phyto estrogens: Isoflavones, daidzein, Geebustin, lignans.

Tocopherols.

Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

Unit-III **10 Hours**

Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

Dietary fibres and complex carbohydrates as functional food ingredients.

Unit-IV **08 Hours**

Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free- radicals theory of ageing.

Antioxidants: Endogenous antioxidants– enzymatic and non-enzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione, Vitamin C, Vitamin E, α-Lipoic acid, melatonin. Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.

Functional foods for chronic disease prevention.

Unit-V **07 Hours**

Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.

Regulatory Aspects: FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

Pharmacopeial Specifications for dietary supplements and nutraceuticals.

Recommended Books (Latest editions)

- Role of Dietary Fibers and Nutraceuticals in Preventing Diseases by K.T. Agusti and P. Faizal: BS Publication.
- Advanced Nutritional Therapies by Cooper. K.A., Thomas Nelson, Inc., USA.
- The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
- Prescription for Nutritional Healing by James F. Balch and Phyllis A. Balch 2nd Ed., Avery Publishing Group, NY (1997).
- Functional Foods by G. Gibson and C. Williams Editors 2000, Woodhead Publ. Co. London.
- Functional Foods by Goldberg, I., 1994. Chapman and Hall, New York.
- Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in Essentials of Functional Foods by M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
- Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition).
- Modern Nutrition in Health and Disease by Shils, M.E., Olson, J.A., Shike, M. 1994, Eighth edition. Lea and Febiger.
- Food Science by Potter N. Norman and J.H. Hotchkiss, CBS Publishers & Distributers Pvt. Ltd., New Delhi.
- Essentials of Food Process Engineering by Chandra Gopala Rao, BS Publications, Hyderabad.
- Food Chemistry and Nutrition - A Comprehensive Treatise by S. Sumathi, BS Publications, Hyderabad.

BP813ET. PHARMACEUTICAL PRODUCT DEVELOPMENT (Theory)

45 Hours

Course Content:

Unit-I **10 Hours**

Introduction to pharmaceutical product development, objectives, and regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms.

Unit-II **10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories:

Solvents and solubilizers. Cyclodextrins and their applications.

Non - ionic surfactants and their applications. Polyethylene glycols and sorbitols.

Suspending and emulsifying agents. Semi solid excipients.

Unit-III **10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories:

Tablet and capsule excipients. Directly compressible vehicles. Coat materials.

Excipients in parenteral and aerosols products. Excipients for formulation of NDDS.

Selection and application of excipients for pharmaceutical formulations, with specific industrial applications.

Unit-IV **08 Hours**

Optimization techniques in pharmaceutical product development. A study of various optimization techniques for pharmaceutical product development with specific examples. Optimization by factorial designs and their applications. A study of QbD and its application in pharmaceutical product development.

Unit-V **07 Hours**

Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.

Recommended Books (Latest editions)

- Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, Charles Bon; Marcel Dekker Inc., USA.
- Encyclopaedia of Pharmaceutical Technology, edited by James Swarbrick, Third Edition, Informa Healthcare publishers.
- Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, by A. Lieberman, Leon Lachman and Joseph B. Schwartz, Marcel Dekker Inc., USA.
- Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, by H.A. Liberman, Martin, M.R and Gilbert S. Banker, Marcel Dekker Inc., USA.
- Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, by Kenneth E. Avis and H.A. Liebermann, Marcel Dekker Inc., USA.
- The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop K Khar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt. Ltd. 2013.
- Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, Lippincott Williams & Wilkins, USA.
- Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K. Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
- Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems by Loyd V. Allen, Jr., N.G. Popovich and H. C. Ansel, Lippincott Williams & Wilkins, USA.
- Aulton's Pharmaceutics – The Design and Manufacture of Medicines by Michael E. Aulton, 3rd Ed., Churchill Livingstone, UK.
- The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS) by Remington.
- Advanced Review Articles related to the topics.

BP803ET to BP814ET (Elective Subjects)

The student has the choice to choose both the elective subjects from the already prescribed list of elective subjects by the PCI **or** choose one elective subject from the existing prescribed list of elective subjects of B. Pharm. programme by the PCI and the other (second subject) elective from list of skill pack/modules available with the LSSSDC from time to time.

BP815PW. PROJECT WORK (On Elective)

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subjects opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

BP816P. REPORT ON INDUSTRIAL TOUR

Visit of students to an industrial establishment or an approved research laboratory. The industrial visit shall include: in case of industry- visit to different sections and subsections of the industry, an idea about the functioning of the industry, product range of the industry and various approvals of the industry; in case of research laboratory-visit to different departments of the laboratory, an idea about the interdisciplinary coordination, contribution of the laboratory to the society and various approvals of the laboratory. A proper report of the same shall be submitted by the students, which shall be subsequently evaluated to assess the impact of the visit.

May be performed at the end of the 7th semester.

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT

SEMESTER – I

BBA-101: Business Organisation
BBA-102: Business Mathematics
BBA-103: Principles of Economics
BBA-104: Book Keeping and Basic Accounting
BBA-105: Business Laws
BBA-106: Fundamentals of Management
BBA-107: Business Ethics

SEMESTER – II

BBA-201: Organisation Behaviour
BBA-202: Business Communication
BBA-203: Indian Economy
BBA-204: Business Statistics
BBA-205: Business Environment
BBA-206: Principles of Accounting

SEMESTER – III

BBA-301: Advertising Management
BBA-302: Indian Banking System
BBA-303: Human Resource Management
BBA-304: Marketing Management
BBA-305: Company Accounts
BBA-306: Company Law

SEMESTER – IV

BBA-401: Consumer Behaviour
BBA-402: Financial Management
BBA-403: Production Management
BBA-404: Sales Management
BBA-405: Research Methodology
BBA-406: Operation Research

SEMESTER – V

BBA-501: Managerial Economics
BBA-502: Entrepreneurship & Small Business Management
BBA-503: Income Tax
BBA-504: Cost and Management Accounting
BBA-505: Industrial Law
BBA-506: Fundamentals of Computer

SEMESTER – VI

BBA-601: International Trade
BBA-602: Strategic Management & Business Policy
BBA-603: Vat & Service Tax
BBA-604: Management Information System
BBA-605: Auditing
BBA-606: Fundamental of E-Commerce

QUALIFYING PAPER

BBA-008: Environmental Studies

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – I

BBA-101: **BUSINESS ORGANISATION**

Unit – I : Meaning and definition of business essentials & scope of business Classification of Business Activities, Meaning, Definition, Characteristics and objectives of Business Organisation, Evolution of Business Organisation . Modern Business, Business & Profession.

Unit – II : Business Unit, Establishing a new business unit. Meaning of Promotion. Features for business, Plant location, Plant Layout & size of business unit.

Unit – III : Forms of Business Organisation. Sole Proprietorship, Partnership, Joint Stock Companies & Co-operatives.

Unit – IV : Business Combination Meaning Causes, Objectives, Types and Forms Mergers, Takeovers and Acquisitions.

Unit – V : Business Finance: Financial need of Business methods & sources of finance. Security Market, Money Market, Study of Stock Exchange & SEBI.

Suggested Readings:

1. Chottorjee S.K. Business Organisation
2. Jagdish Prakash Business Organistaton and Management
3. Om Prakash Business Organisation
4. Sherlekar S.A. Business Organisation and Management
5. Singh & Chhabra Business Organisation

BBA-102: BUSINESS MATHEMATICS

Unit – I : Matrix: Introduction, Square Matrix, Row Matrix, Column Matrix, Diagonal Matrix, Identity Matrix, Addition, Subtraction & Multiplication of Matrix, Use of Matrix in Business Mathematical Induction

Unit – II : Inverse of Matrix, Rank of Matrix, Solution to a system of equation by the adjoint matrix methods & Guassian Elimination Method.

Unit – III : Percentage, Ratio and Proportion, Average, Mathematical Series-Arithmetic, Geometric & Harmonic, Simple Interest & Compound Interest.

Unit – IV : Set theory- Notation of Sets, Singleton Set, Finite Set, Infinite Set, Equal Set Null Set, Subset, Proper Subset, Universal Set, Union of Sets, Inter-section of Sets, Use of set theory in business, Permutation & Combination

Unit – V : Concept of Differentiation and Integration, Maxima and Minima in Differentiation, Application of Differentiation & Integration in Business (No proof of theorems. Etc)

Suggested Readings:

1. Mehta & Madnani Mathematics for Economics
2. Mongia Mathematics for Economics
3. Zamiruddin Business Mathematics
4. Raghavachari Mathematics for Management

BBA-103: PRINCIPLES OF ECONOMICS

Unit – I : Definition, Nature, Scope & Limitation of Economics as an art or Science. Relevance of Economics in Business Management, Utility analysis, Marginal Theory of utilities and Equi-Marginal theory of utility.

Unit – II : Meaning of demand. Demand theory and objectives, Demand analysis. Demand schedule. Demand Curve and Nature of Curves, Laws of Demand Elasticity of Demand Types & Measurement, Indifference curves analysis Consumer Equilibrium & Consumer Surplus. Price, Income and substitution effect.

Unit – III : Production-Meaning and Analysis Production function. Laws of production, Laws of increasing returns & Laws of constant returns. Equal product curves and Producer equilibrium.

Unit – IV : Market analysis-Nature of market, Types of markets and their characteristics Pricing under different market structures-Perfect Monopoly, oligopoly and Monopolistic completion. Price discrimination under monopoly competition.

Unit – V : Theories of factor pricing, factor pricing v/s product pricing. Theories of rent theories of interest theories of wages theories of profit, Concept of profit maximization

Suggested Readings:

1. Adhjkari M Management Economics
2. Gupta G.S. Managerial Economics
3. Lal S.M. Principles of Economics
4. Vaish & Sunderm Principles of Economics

BBA-104: BOOK KEEPING AND BASIC ACCOUNTING

Unit – I : Meaning of book keeping. Process of book keeping and accounting, Basic terminology of accounting, subsidiary books of accounts, Difference between accounting & book keeping. Importance & Limitations of Accounting, Various users of Accounting Information, Accounting Principles, conventions & Concepts.

Unit – II : Accounting Equation, Dual Aspect of Accounting Types of accounting Rules of debit & Credit, Preparation of Journal and Cash book including banking transaction, Ledger and Trial balance.

Unit – III : Rectification of errors preparation of bank reconciliation Statement, Bills of Exchange And promissory notes.

Unit – IV : Valuation of stocks, Accounting treatment of depreciation. Reserve and provision, Preparation of final accounts along with adjustment entries.

Unit – V : Issue of shares and debentures, Issue of bonus shares and right issue, Redemptioment preference shares and debentures.

Suggested Readings:

1. Agarwal B.D. Advanced Accounting
2. Chawla & Jain Financial Accounting
3. Chakrawarti K.S. Advanced Accounts.
4. Gupta R.L. & Radhaswamy Fundamentals of Accounting
5. Jain & Narang Advanced Accounts
6. Shukla & Grewal Advanced Accounts

BBA-105: BUSINESS LAWS

Unit – I : Indian Contract Act: Definition and essentials, Contracts agreements, Offer & Acceptance Consideration, Capacity of parties Free Consent, Performance of Contracts, Terminal of Contract, Consequence and Remedies of Contract terminal.

Unit – II : Contingent contract, Implied, Quasi contract, Indemnity Contract, Guarantee contract, Bailment, Lien, Pledge contract, Agency contract.

Unit – III : Sales of Goods Act: Sale contract-Definition, Features, Formation of Contract Contents of sale contract-Goods, Price, Condition and Warranty, Ownership of goods and transfer, Performance of sale contract, Delivery, Rights of unpaid sellers, Auction Sale.

Unit – IV : Indian Partnership Act: Definition and Nature of Partnership, Partnership deed Mutual and Third parties relation of Partners, Registration of Partnership Dissolution of Partnership.

Unit – V : Definition Features Types Recognition And Endorsement of Negotiable Instruments.

Suggested Readings:

1. Dhanda PMV Commercial and Industrial Laws
2. Kapoor D Elements of Mercantile law (including Companing Law Industrial Law)
3. Gulshan S and Kapoor Lectures on Business & Economics Laws
4. Kuchall Business Laws
5. Mandal C. Economics and other Legislations

BBA-106: FUNDAMENTALS OF MANAGEMENT

Unit – I : Introduction Concepts, Objectives, Nature Scope and significance of management Evolution of management thought-Contribution Taylor, Weber and Fayol management.

Unit – II : Planning: Concept, Objectives, Nature, Limitation, Process of planning, Importance, Forms, Techniques and Process of decision making.

Unit – III : Organizing: Concept, Objectives, Nature of organizing, Types of Organization, Delegation of authority, Authority and responsibilities, Centralization and Decentralization Span of Control.

Unit – IV : Directing: Concept, Principles & Techniques of directing and Coordination Concept of leadership-Meaning. Importance, Styles, Supervision, Motivation Communication.

Unit – V : Controlling: Concept, Principles, Process and Techniques of Controlling, Relationship between planning and controlling.

Suggested Readings:

1. Pagare Dinkar Principles of Management
2. Prasad B M L Principles and Practice of Management
3. Satya Narayan and Raw VSP Principles and Practice of Management
4. Srivastava and Chunawalla Management Principles and Practice

BBA-107: BUSINESS ETHICS

Unit – I : Business Ethics- An overview-Concept, nature, evolving ethical values, Arguments against business Ethics.

Unit – II : Work life in Indian Philosophy: Indian ethos for work life, Indian values for the work place, Work-life balance.

Unit – III : Relationship between Ethics & Corporate Excellence-Corporate Mission Statement, Code of Ethics, Organizational Culture, TQM.

Unit – IV : Gandhian Philosophy of Wealth Management-Philosophy of Trusteeship, Gandhiji's Seven Greatest Social Sins

Unit – V : Corporate Social Responsibility-Social Responsibility of business with respect to different stakeholders, Arguments for and against Social responsibility of business, Social Audit.

Suggested Readings:

1. Koltar, Philip Marketing Management
2. Stanton, Etzel Walker, Fundamentals of Marketing
3. Saxena Rajan Marketing Management
4. McCarthy, FJ Basic Marketing

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – II

BBA-201: ORGANISATION BEHAVIOUR

Unit – I : Introduction, nature and scope of OB, Challenges and opportunities for OB, Organization Goals, Models of OB, Impact of Global and Cultural diversity on OB.

Unit – II : Individual Behavior - Individual behavior, Personality, Perception and its role in individual decision making, Learning, Motivation, Hierarchy of needs theory, Theory X and Y, Motivation- Hygine theory, Vrooms Expectancy theory

Unit – III : Behavior Dynamics: Interpersonal behavior, Communication, Transaction Analysis, The Johari Window, Leadership, Its Theories and Prevailing Leadership styles in Indian Organisations.

Unit – IV : Group Behavior: Definition and classification of Groups, Types of Group Structures, Group decision making, Teams Vs Groups, Contemporary issues in managing teams, Inter group problems in organizational group dynamics, Management of conflict.

Unit – V : Management of Change: Change and Organisational development, Resistance to change, Approaches to managing organizational change, Organisational effectiveness, Organisational culture, Power and Politics in Organisational Quality of work life, Recent advances in OB.

Suggested Readings:

1. Bennis, W.G. Organisation Development
2. Breech Islwar Oragnaistion-the frame-Work of Management
3. Dayal, Keith Organisational Development
4. Sharma, R.A. Organisational Theory and Behavior
5. Prasad, L.M. Organisational Behavior

BBA-202: BUSINESS COMMUNICATION

Unit – I : Meaning and objective of Business communication, Forms of Communication, Communication model and process, Principles of Effective Communication

Unit – II : Corporate Communication: Formal and Informal Communication, Networks, Grapevine, Barriers in Communication, Groups discussion, Mock Interviews, Seminars, Individual and Group Presentations

Unit – III : Essential of effective Business letters, Writing Important Business letters including correspondence with Bank and Insurance companies.

Unit – IV : Oral & Non-verbal communication: Principles of Oral Presentation Factors affecting Presentation, effective Presentation skills, conducting Surveys.
Body Language, Para Language, Effective Listening, Interviewing skill, Writing resume and Letter or application

Unit – V : Modern forms of communication, International communication, Cultural sensitiveness and cultural context, Writing and presenting in international situations.

Suggested Readings:

1. Bapat & Davar A Text book of Business Correspondence
2. Bhende D.S. Business Communication
3. David Berio The Process of Communication
4. Gowd & Dixit Advance Commercial Correspondence
5. Gurky J.M. A reader in human communication

BBA-203: INDIAN ECONOMY

Unit – I : Meaning of Economy, Economic growth & development, characteristics of India Economy, Concepts of Human development, Factors affecting economic development.

Unit – II : An overview of Economic Resources of India, Human Resources of India: Concept of Population Explosion Interrelation of Population and economic development, Population policy of India, Problem of Unemployment in India.

Unit – III : Economic planning in India; Planning commission, Critical evaluation of current Five Year Plan.

Unit – IV : Problems and prospects of Indian Agriculture, agriculture development during plan period. Position, Problems and Prospects of Large Scale Industries. (Iron, Steel, Sugar, Cotton, Textile)

Unit – V : Service and Entrepreneurial Sector, role of Commercial Bank and Financial Institutions, Role of Small Scale Industries in Indian Economy.

Suggested Readings:

1. Kenes J.M. General Theory of Employment, Interest and Money
2. Brooman Macro Economics
3. Seth, M..L. Monetary Theory
4. Vaish, M.C. Monetary Theory
5. Singh, S.P. Macro Economics

BBA-204: BUSINESS STATISTICS

Unit – I : Statistics: Concept, significance & Limitation Type of Data, Classification & Tabulation, Frequency Distribution & graphical representation.

Unit – II : Measures of Central Tendency (Mean, Medium, Mode) Measures of Variation: Significance & Prosperities of a good measure of variation: Range, Quartile Deviation, Mean Deviation and Standard Deviation, Measures of Skewness & Kurtosis.

Unit – III : Correlation: Significance of Correlation, Types of correlation, Simple correlation, Scatter Diagram method, Karl Pearson Coefficient of Correlation. Regression: Introduction, Regression lines, and Regression Equation & Regression coefficient.

Unit – IV : Probability: Concept, Events, Addition Law, Conditional Probability, Multiplication Law & Baye's theorem [Simple numerical], Probability Distribution: Binomial, Poisson and Normal.

Unit – V : Sampling Method of sampling, Sampling and Non-sampling errors. Test of Hypothesis, Type- I and Type -II Errors, Large sample tests

Suggested Readings:

1. Gupta, S.P. & Gupta, M.P. Business Statistics
2. Levin, R.I. Statistics for Management
3. Feud, J.E. Modern Elementary Statistics
4. Elhance, D.N. Fundamentals of Statistics
5. Gupta, C.B. Introduction of Stastical Methods

BBA-205: BUSINESS ENVIRONMENT

Unit – I : Concept, Significance, Components of Business environment, Factor affecting Business Environment, Social Responsibilities of Business.

Unit – II : Economic Systems: Capitalism, Socialism, Communism, Mixed Economy-Public Sector & Private Sector

Unit – III : Industrial Policy -Its historical perspective (In brief); Socio-economic implications of Liberalisation, Privatisation, Globalisation.

Unit – IV : Role of Government in Regulation and Development of Business; Monetary and Fiscal Policy; EXIM Policy, FEMA

Unit – V : Overview of International Business Environment, Trends in World Trade: WTO- Objectives and role in international trade.

Suggested Readings:

1. Francis Cherunilum Business Environment
2. K.Aswathapa Business Environment

BBA-206: PRINCIPLES OF ACCOUNTING

Unit – I : Accounting standards in India, Concept of GAAP (Generally Accepted Accounting Principles) International Accounting Standards, Accounting for Price level changes.

Unit – II : Accounting of Non-trading Institutions, Joint Venture an Consignment.

Unit – III : Accounts of banking companies and General Insurance companies, Department and Branch account.

Unit – IV : Accounts related to Hire Purchase and Installment payment transactions, Royalty Accounts

Unit – V : Partnership Accounts: Final Account, Reconstitiution of Partnership firms-admission, retirement and death of a partner, Dissolution of Partnership (Excluding insolvency of Partner).

Suggested Readings:

1. Agarwal, B.D. Advanced Accounting
2. Chawla & Jain Financial Accounting
3. Chakrawarti, K.S. Advanced Accounts
4. Shukla, M.B. Financial Analysis and Business Forecasting
5. Jain & Naranag Advanced Accounts

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – III

BBA-301: ADVERTISING MANAGEMENT

Unit – I : Advertising: Introduction, Scope, importance in business: Role of advertising in social and economic development of India: Ethics and truths in Indian Advertising.

Unit – II : Integrated Communication Mix (IMC)-meaning, importance; Communication meaning, importance, process, communication mix-components, role in marketing, Branding-meaning, importance in advertising.

Unit – III : Promotional objectives - importance determination of promotional objectives, setting objective DAGMAR; Advertising Budget importance, establishing the budget-approaches allocation of budget.

Unit – IV : Advertising Copy-meaning components types of advertising copy, importance of creativity in advertising; Media planning-importance, strategies, media mix.

Unit – V : Advertising research - importance, testing advertising effectiveness market testing for ads; International Advertising-importance, international Vs local advertising.

Suggested Readings:

1. Advertising and Promotion George E. Beich & Michael A. Belch. T.M.H.
2. Advertising Management, Concept and Cases Manendra Mohan, TMH
3. Advertising Management Rajeev Batra, PHI

BBA-302: INDIAN BANKING SYSTEM

Unit – I : Indian Banking System : Structure and organization of banks; Reserve bank of India; Apex banking institutions; Commercial banks; Regional rural banks; Co-operative banks; Development banks.

Unit – II : State Bank of India: Brief History; Objectives Functions; Structure and organization; Working and progress.

Unit – III : Banking Regulation Act, 1949: History; Social Control; Banking Regulation Act as applicable to banking companies and public sector banks; Banking Regulation Act as applicable to Cooperative banks.

Unit – IV : Regional Rural and Co-operative banks in India: Functions; Role of regional rural and co-operative bank in rural India; Progress and performance.

Unit – V : Reserve Bank of India; Objectives; Organization; functions and working; monetary policy credit control measures and their effectiveness.

Suggested Readings:

1. Basu A.K. : Fundamentals of banking- Theory and Practice; A. Mukherjee and Co., Calcutta
2. Sayers R.S. : Modern Banking; Oxford University, Press.
3. Panandikar, S.G. and Mithani D.M.: Banking in India; Orient Longman
4. Reserve Bank of India : Functions and Working
5. Dekock : Central Banking; Crosby Lockwood Staples, London
6. Tennan M.L.: Banking-Law and Practice in India; India law House, New Delhi.

BBA-303: HUMAN RESOURCE MANAGEMENT

Unit – I : Introduction to HRM & HRD Concept of HRM, Objectives, Process, HRM vs. Personnel Management, HRM Vs. HRD, Objectives of HRD, focus of HRD System, Structure of HRD System, role of HRD manpower.

Unit – II : Human Resource Policies & Strategies Introduction, role of HR in strategic management, HR policies & Procedures, HR Programme., developing HR policies and strategies, Strategic control, Types of Strategic control, Operational Control System, Functional and grand strategies, Strategy factors.

Unit – III : Human Resource Procurement & Mobility Productivity & improvement job analysis & Job design, work measurement, ergonomics. Human Resource planning-objectives, activities, manpower requirement process Recruitment & Selection Career planning & development, traning methods, basic concept of performance appraisal. Promotion & Transfer.

Unit – IV : Employee Compensation Wage policy, Wage determination, Wage boar, factors affecting wages & Salary, systems of payments, Job evaluation, components of wage/salary-DA, incentives, bonus, fringe benefits etc., Minimum Wages Act 1948, Workmen Compensation Act 1923, Payment of bonus Act 1965.

Unit – V : Employee relations Discipline & Grievance handling types of trade unions, problems of trade unions

Suggested Readings:

1. Human Resource Management - Dipak Kumar Bhattacharya
2. Managing Human Resource-Arun Monappa
3. Essential of HRM and Industrial Relations-P.Subba Rao
4. Personnel Management-C.B. Memoria

BBA-304: MARKETING MANAGEMENT

Unit – I : Marketing: Definition, nature, scope & importance, Marketing Management, Core concepts of marketing, selling concept, production concept, modern marketing concept, Societal marketing.

Unit – II : Segmentation: Concept, basis of segmentation, Importance in marketing; Targeting: Concept Types, Importance; Positioning: Concept, Importance, Brand positioning, Repositioning.

Unit – III : Marketing Mix:
Product: Product Mix, New Product development, levels of product, types of product, Product lofe cycle, Branding and packaging.
Distribution: Concept, importance, different types of distribution channels etc.

Unit – IV : Price: Meaning, objective, factors influencing pricing, methods of pricing.
Promotion: Promotional mix, tools, objectives, media selection & management.

Unit – V : Marketing Research: Importance, Process & Scope Marketing Information Systems: Meaning Importance and Scope Consumer Behavior: Concept, Importance and factors influencing consumer behavior.

Suggested Readings:

1. Marketing Mgt. by Philip Kotlar (PHI)
2. Marketing by Etzet, Walker, Stanton
3. Marketing Management by Rajan Saxena

BBA-305: COMPANY ACCOUNTS

Unit – I : Joint Stock Companies- its types and share capital, Issue, Forfuture and Re-issue of shares, Redemption of preference shares, Issue and Redemption of Debenture.

Unit – II : Final Accounts: Including Computation of managerial Remuneration and disposal of profit.

Unit – III : Accounting for Amalgamation of companies as per Accounting Standard 14 Accounting for Internal reconstruction.

Unit – IV : Consolidated Balance Sheet of Holding Companies with one Subsidiary Only.

Unit – V : Liquidation of Company, Statement of Affairs and Deficiency/Surplus, Liquid for final statement of A/c Receivers Receipt and Payment A/c.

Suggested Readings:

1. Gupta R.L. Radhaswamy M, Company Accounts, Sultan chand &
2. Maheshwari, S.N., Corporate Accounting, Vikas Publishing
3. Monga J.R., Ahuja, Girish, and Sehgal Ashok, Financial Accounting
4. Shukla, M.C., Grewal T.s. and Gupta, S.C. Advanced Accounts, S. Chand & Co.
5. Moore C.L. and Jaedicke R.K., Management Accounting

BBA-306: COMPANY LAW

Unit – I : Corporate Personality: Kinds of Company, Promotion and Incorporation of Companies.

Unit – II : Memorandum of Association, Articles of Association Prospectus.

Unit – III : Shares; Share Capital, Members, Share Capital- Transfer and Transmission, Directors-Managing Director, Whole Time Director.

Unit – IV : Capital Management-Borrowing powers, mortgages and charges, debentures, Company Meetings-kinds quorum, voting resolutions, minutes.

Unit – V : Majority Powers and minority Rights Prevention of oppression and mismanagement, winding up-Kinds and Conduct.

Suggested Readings:

1. Grower L.C.B. Principles of Modern Company Law, Stevens & Sons, London
2. Ramaiya A. Guide to the Companies Act. Wadhwa & Co., Nagpu
3. Singh, Avtar Company Law, Eastern Book Co. , Lucknow
4. Kuchal, M.C. Modern Indian Company Law, Sri Mahavir Books, Noida
5. Kapoor, N.D. Company Law- Incorporating the Provisions of the Companies Amendment Act, 2000, Sultan & sons

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – IV

BBA-401: CONSUMER BEHAVIOUR

Unit – I : Introduction to consumer Behavior (CB)- Importance, Scope, need for studying CB, Consumer research process.

Unit – II : Consumer models: Economic model, Psychoanalytic model, Sociological model, Howard & Seth model, Nicosia model, Engel-kollat-Blackwell model.

Unit – III : Individual determinates: Perceptual process, consumer learning process, consumer attitude formation, attitude measurement, meaning and nature of personality, self concept.

Unit – IV : Influences & Consumer Decision making : Family, reference group, personal, social and cultural influence on CB, Consumer Decision making process, Consumer Communication process, consumer satisfaction.

Unit – V : Industrial Buying Behaviour : Participants, characteristics of industrial markets, factors influencing industrial markets, stages of industrial buying process, Customer and marketing of services.

Suggested Readings:

1. Consumer Behaviour in Indian Perspective Suja. R. Nair
2. Consumer Behaviour Schifman & Kanuk
3. Consumer Behaviour Louden & Bitta
4. Consumer Behaviour Bennet & Kasarjian

BBA-402: FINANCIAL MANAGEMENT

Unit – I : Introductory: Concept of Financial management, Finance functions, objectives of financial management- Profitability vs. shareholder wealth maximization. Time value of Money-Compounding & Discounting.

Unit – II : Capital Structure Planning: capitalization Concept, basis of capitalization, consequences and remedies of over and under capitalization. Determinants of Capital structure, Capital structure theories.

Unit – III : Management of Fixed Capital: Cost of Capital, Nature & Scope of Capital budgeting-payback NPV, IRR and ARR methods and their practical applications. Analysis of risk & uncertainty.

Unit – IV : Management of Working Capital: Concepts of working Capital, Approaches to the financing of current Assets determining capital (with numerical problems) Management of different components of working capital.

Unit – V : Management of Earning: Concept & relevance of Dividend decision. Dividend Models-Water, Gordons, MM Hypothesis. Dividend policy-determinants of dividend policy.

Suggested Readings:

1. Financial Management S.N. Maheshwari
2. Financial Management Khan & Jain

BBA-403: PRODUCTION MANAGEMENT

Unit – I : Nature & Scope of Production Management, Functions of Production Management, Production Systems, responsibilities of Production manager. Production Planning & Control (PPC), Objectives of PPC.

Unit – II : Types of manufacturing Systems: Intermitted & Continuous Systems etc., Product design & development.

Unit – III : Plant Location & Plant layout.

Unit – IV : Materials Management & Inventory Control : Purchasing Economic lot quality/Economic order quantity(EOR), Lead time, Rorder level. Brief of ABC analysis, Stock Keeping. Quality

Unit – V : Control: Quality, Quality assurance, Quality Circles, TQM, JIT, Statistical Quality Control

Suggested Readings:

1. Production Operation management B.S. Goel
2. Production &. Operation Management Buffa
3. Production & Operation Management S.N Chany

BBA-404: SALES MANAGEMENT

Unit – I : Sales Management :
- Evolution of sales function
- Objectives of sales management positions - Functions of Sales executives
- Relation with other executives

Unit – II : Sales Organisation and relationship: - Purpose of sales organization - Types of sales organization structures - Sales department external relations Distributive network relations.

Unit – III : Salesmanship :
- Theories of personal selling
- Types of Sales executives
- Qualities of sales executives
- Prospecting, pre-approach and post-approach- Organising display, showroom & exhibition

Unit – IV : Distribution network Management
- Types of Marketing Channels
- Factors affecting the choice of channel
- Types of middleman and their characteristics
- Concept of physical distribution system Sales

Unit – V : Force Management
- Recruitment and Selection
- Sales Training
- Sales Compensation

Suggested Readings:

1. Sales Management -Cundiff, Still, Govoni
2. Salesmanship & Publicity -Pradhan, Jakate, Mali
3. Sales Management -S.A. Chunawalla

BBA-405: RESEARCH METHODOLOGY

Unit – I : Introduction - Meaning of Research ; Objectives of Research; Types of Research; Research Process; Research Problem formulation.

Unit – II : The Design of Research-Research Design; Features of a Good design; Different Research Designs ; Measurement in Research; Data types; Sources of Error.

Unit – III : Sampling Design- Census & Sample Surveys; Steps in Sampling Design; Types of Sample designs-Probability & Non Probability sampling.

Unit – IV : Processing & Analysis of Data- Processing operations; problems in processing; types of analysis Hypothesis Testing-Chi-square test, Z test, t-test, f-test.

Unit – V : Presentation- Diagrams; graphs; chars. Report writing; Layout of Research report; Types of Reports; Mechanism of writing a Research report; Precaution for writing report.

Suggested Readings:

1. Research Methodology C.R. Kothari

BBA-406: OPERATION RESEARCH

Unit – I : Nature, Definition & characteristics of operations research, Methodology of DR, Models in OR; OR & managerial Decision making, OR techniques.

Unit – II : Linear programming: Introduction, Advantages of Linear Programming, Applications areas of Linear Programming. LPP-problem formulation, Graphic Method, Simplex Method (including Big M method)

Unit – III : Transportation-North West Corner Rule, matrix Minima & VAM Methods, Degenerating, MODI Method. Assignment Problems

Unit – IV : Decision making under Uncertainty-Criteria of Maximax, maximin, Maximax Regret, laplace & Hurwinz. Decision making under Risk-Criteria of EMV & EOL, Decision Tree approach & its applications.

Unit – V : PERT & CPM-Introduction, Network Analysis, Time Estimates in Network Analysis, Critical Path Method; Programme Evaluation & Review Technique.

Suggested Readings:

1. Operation Research V.K. Kapoor

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – V

BBA-501: MANAGERIAL ECONOMICS

Objective: The Basic objective of this course is to familiarize the students with the concepts and tools of managerial Economics as applicable to decision making in contemporary business environment.

Unit – I : Nature and Scope: Nature and Scope of Managerial Economics, its relationship with other subjects. Fundamental Economic Tools-Opportunity cost concept, Intermental concept, Principle of time perspective, Discounting principle and Equimarginal principle.

Unit – II : Demand Analysis: Concept and importance of Demand & its determinants Income & Substitution effects. Various elasticities of demand, using elasticities in managerial decisions, revenue concepts, and relevance of demand forecasting and methods of demand forecasting.

Unit – III : Cost Concept: Various cost concepts and classification, Cost output relationship in short run & long run cost curves). Economics and diseconomies of scale, Cost control and Cost reduction, Indifferent curves.

Unit – IV : Pricing: Pricing methods, Price and output decisions under different market structures-perfect competition, Monopoly and Monopolistic Competition, Oligopoly.

Unit – V : Profit Management & Inflation: Profit, Functions of profit, Profit maximization, Break Even analysis. Elementary idea of Inflation.

Suggested Readings:

1. Varsney & Maheshwari Managerial Economics
2. Mote Paul & Gupta Managerial Economics : Concepts & Cases
3. D.N.Dwivedi Managerial Economics
4. D.C.Huge Managerial Economics
5. Peterson & Lewis Managerial Economics
6. Trivedi Managerial Economics
7. D.Gopalkrishnan A Study of Managerial Economics

BBA-502: ENTREPRENEURSHIP & SMALL BUSINESS MANAGEMENT

Objective: The objective of the course is to familarise the students with the basic concepts of entrepreneurship.

Unit – I : Name & Scope Role & Importance in Indian Economy, Theories of Entrepreneurship traits of entrepreneur, entrepreneurs Vs professional managers, problems faced by entrepreneurs.

Unit – II : Entrepreneurial Development Entrepreneurial Development, Significance and role of environment infrastructural network, environmental analysis, E.D. programmes (EDP), problems of EDP.

Unit – III : Transportation-North West Corner Rule, matrix Minima & VAM Methods, Degenerating, MODI Method. Assignment Problems

Unit – IV : Project & Reports Search for business idea, transformation of idea into reality: projects and classification. Identification of projects, project design and network analysis, project appraisal plant layout.

Unit – V : Small industry setup Types of organization-sole proprietorship, partnership, joint stock company, co-operative organization, their merits, limitations, suitability. Organisational locations, steps in starting a small industry, incentives and subsidies available, export possibilities.

Suggested Readings:

1. Entrepreneruship Development Vasant Desai

BBA-503: INCOME TAX

Objective- It enables the student to know the basics of Income Tax and its implications.

Unit – I : Basic Concept: Income, Agriculture Income, Casual Income, Assessment Year. Previous Year. Gross Total Income, Total Income, Person, Tax Evasion, Avoidance and Tax Planning.

Unit – II : Basis of Charge: Scope of Total Income, Residence and Tax Liability, Income which does not form part of Total Income.

Unit – III : Heads of Income: Income from Salaries, Income from House Properties.

Unit – IV : Heads of Income: Profit and Gains of Business or Profession, Including Provisions relating to specific business, Capital Gains, Income from other sources.

Unit – V : Aggregation of Income, Set off and Carry forward of losses, deduction from gross total Income.

Suggested Readings:

1.Mehrotra,H.C. Income Tax Law and Account

2.Prasad, Bhagwati Income Tax Law and Practice 3.Chandra Mahesh and Shukla D.C. Income Tax Law and Practice 4.Agarwal,B.K. Income Tax

5.Jain,R.K. Income Tax

BBA-504: COST AND MANAGEMENT ACCOUNTING

Unit – I : Introduction: Nature and Scope of Cost Accounting, Cost, concepts and Classification, Methods and Techniques, Installation of Costing System.

Unit – II : Accounting for Material, Labour and Overheads.

Unit – III : Element of Cost, Assessment of Cost-Preparation of Cost Sheet and Statement of Cost.

Unit – IV : Management Accounting - Meaning, Nature, Scope, Functions Relationship of Management Accounting, Financial Accounting and Cost Accounting.

Unit – V : Marginal Costing and Absorption Costing.

Suggested Readings:

1. Maheshwari S.N. : Advanced Problem and Solutions in Cost Accounting
2. Khan & Jain : Management Accounting
3. Gupta, S.P. : Management Accounting

BBA-505: INDUSTRIAL LAW

Unit – I : Factory act 1948.

Unit – II : Workmen compensation act 1923

Unit – III : Industrial dispute act 1947, Minimum wages act 1948

Unit – IV : Employee state insurance act 1948.

Unit – V : Employee provident fund act 1952 Payment of gratuity act 1972.

Suggested Readings:

1. Element of industrial law N D Kapoor

BBA-506: FUNDAMENTALS OF COMPUTER

Unit – I : History of computing, Characteristics of computers, Limitations of computers, Basic computer organization, Generations of computers.

Unit – II : Input-Output Devices : Keyboard, Mouse, Light pen, touch screens, VDU, Scanners, MICR, OCR, OMR, Printers and its type, Plotters, Microfilm, Microfiche, Voice Recognition and Reponse Devices.

Unit – III : Storage Devices : Primary and Secondary Storage devices- RAM, ROM, Cached Memory, Registers, Storage Concept, Hard disk, Floppy disk, CD-ROM, Magnetic tapes and cartridges, comparison of sequential and direct- Access devices.

Unit – IV : Computer Software : Relationship between hardware and software, Computer languages-Machine language Assembly language, High-level languages, Compliers & interpreters, Characteristics of good language.

Unit – V : Operating System & Internet: Definition and functions of O.S. Batch Processing, Multipurpossing, Multiprogramming, time sharing, On-line process, Real time process. Introduction to window-98, Internet & its uses, terminology of internet, Browser, Search engines, E-Mail, Video conferencing.

Suggested Readings:

1. Computer Fundamental — Sinha, P.K.
2. Fundamentals of Computers — Jain, V.K.
3. Operating System — Godbole, G.B.
4. Window-98 — Manual
5. Internet — Leon & Leon

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

COURSE CONTENT FOR SEMESTER – VI

BBA-601: INTERNATIONAL TRADE

Unit – I : Basics of international trade: Basics of international trade, international trade theories, drivers of international trade, restraining forces, recent trends in world trade.

Unit – II : Foreign trade & economic growth: Foreign trade & economic growth, balance of trade, balance of payments, free trade, forms and restrictions.

Unit – III : International economic institutions: International economic institutions, IMF, World Bank, WTO (in brief), Regional economic groupings NAFTA, EU, ASEAN, SAARC.

Unit – IV : Recent trends in India's foreign trade: Recent treds in India's foreign trade, institutional infrastructure for export promotion in India, projects & consultancy exports.

Unit – V : India's Trade Policy: India's Trade policy, export assistance, marketing plan for exports.

Suggested Readings:

1. Varshney & Bhattacharya : International Marketing

BBA-602: STRATEGIC MANAGEMENT & BUSINESS POLICY

Unit – I : Nature & importance of Business Policy, Development & Classification of Business Policy; Mechanism or Policy making.

Unit – II : Responsibilities & tasks of Top Management: objectives of Business Characteristics, Classification, Types of objectives and their overall Hierachy, Setting of objectives, Key areas involved.

Unit – III : Corporate Planning; Concept of long term planning, Strategic Planning, Nature, Process & Importance.

Unit – IV : Corporate Strategy: Concept, Components, Importance, and Strategy Formulation: Concept, Process & Affecting Factors. Strategy Evaluation: Process, Criteria, Environmental Analysis, Resource Analysis

Unit – V : Concept of Synergy: Types, Evaluation of Synergy. Capability Profiles, Synergy as a Component of Strategy & its relevance

Suggested Readings:

1. Peter F. Drucker Management Task & Responsibilities
2. Igor Ansoff Corporate Strategy
3. Gluek & Jaunch Corporate Strategy
4. Hatton & Hatton Strategic Management
5. Christian, Anderson, Bower Business Policy
6. McCarthy, IninChiello, Curran Business Policy & Strategy
7. Azhar Kazmi Business Policy
8. Stanford ManagementPolicy

BBA-603: VAT & SERVICE TAX

Unit – I : Legislative background, Basic concept of VAT-white paper on VAT, Report of Empowered Committee of State Finance Ministers, constitutional provisions, liability under VAT, Importance Definition under VAT, Difference between Sales Tax System and VAT

Unit – II : Computation(VAT Variants), Procedural aspects including registration, Rates of tax, Assessment, Input Tax Credit, Filling of Returns, Refunds, Audit, Appeals, Revision and Appearances.

Unit – III : Appointment, jurisdiction and powers of authorities under VAT, Concept of VAT on Services, Central Sales Tax; Goods and Service Tax.

Unit – IV : Background, Statutory provisions, Taxable services, valuation, administrative mechanism and registration under service tax, rate and computation of service tax.

Unit – V : Assessment, levy, collection and payment of service tax, exemptions, CENVAT credit for service tax, Filing of Returns, Appeals, Revisions.

Suggested Readings:

1. Systematic Approach to Income Tax, Dr. Girish Ahuja and Dr. Ravi Gupta
   Bharat law House.
2. Indirect Taxes law and Practice, V.S. Datey, Taxman
3. Income Tax, Dr. V.K. Singhania, Taxman

BBA-604: MANAGEMENT INFORMATION SYSTEM

Unit – I : Management Information System(MIS): Concept & definition, Role of MIS, Process of Management, MIS-A tool for management process, Impact of MIS, MIS & computers, MIS & the user, IMS- a support to the Management.

Unit – II : Planning & Decision making: The concept of corporate planning, Strategic planning, Type of strategic, Tools of Planning, MIS-Business Planning; Decision making concepts, Methods, tools and procedures, Organizational Decision making, MIS & Decision making concepts.

Unit – III : Information & System: Information concepts, Information: A quality product classification of the information, Methods of data & information collection, Value of information, MIS & System concept, MIS & System analysis, Computer System design.

Unit – IV : Development of MIS: Development of long rage plans of the MIS. Ascertaining the class of information, determining the information requirement, Development and implementation of the MIS, Management of quality in the MIS, organization for development of the MIS, MIS: the factors of success and failure.

Unit – V : Decision Support System (DSS): Concept and Philosophy, DSS: Deterministic Systems, Artificial intelligence(AI) System, Knowledge based expert system(KBES), MIS & the role of DSS, Transaction Processing System(TPS), Enterprise Management System(EMS), Enterprise Resource Planning (ERP) System, Benefits of ERP, EMS & ERP

Suggested Readings:

1. Management Information System, Jawadekar W S
2. Managing with information, Kanter, Jerome
3. Management Information System, Louden & Louden
4. Information system for Modern Management, Murdick & Ross, R.claggetti

BBA-605: AUDITING

Unit – I : Introduction: Meaning and objectives of Auditing, Types of Audit, Internal Audit, Audit Programme, Audit Notebook, Routine Checking and Test Checking.

Unit – II : Internal Check System: Internal Control, audit Procedure: Vouching Verification of Assets and Liabilities.

Unit – III : Audit of Limited Companies: Company Auditor- Appointment, Powers, Duties and Liabilities. Auditor's Report and Audit Certificate.

Unit – IV : Special Audit, Audit of Banking Companies, Audit of Insurance Companies, Audits of Educational Institutions, Audit of Cooperative Societies, Efficiency Audit, Social Audit etc.

Unit – V : Recent trends in Auditing: Nature and Significance of Cost Audit, Tax Audit, Management Audit.

Suggested Readings:

1. BK BasuAn insight with Auditing
2. Kamal Gupta Contemporary Auditing

BBA-606: FUNDAMENTAL OF E-COMMERCE

Unit – I : E-Commerce: Introduction, meaning and concept; Needs and advantages of e-commerce; Traditional commerce; Types of E-Commerce, Basic requirements of E-Commerce.

Unit – II : Internet: Concept & evaluation, Characteristics of Internet: email, WWW. Ftp, telnet, Intranet & Extranet, Limitation of internet, Hardware & Software requirement of Internet, searches Engines.

Unit – III : Electronic Payment Systems: E-Cash, e-cheque, credit cards, debit cards, smart cards, E-Banking, Manufacturing information systems.

Unit – IV : EDI introduction, networking infrastructure of EDI, Functions & Components of EDI File types of EDI.

Unit – V : Security issues of e-commerce: Firewall, E-locking, Encryption; Cyber laws-aims salient provisions; PKI (Public key infrastructure)

Suggested Readings:

1. Frontiers of E-CommerceRavi Kalkota, TMH
2. O, Brien JManagement Information System, TMH
3. Oberoi, Sundeep E-Security and You, TMH
4. Young, Margret Levine The complete reference to Internet, TMH

CHAUDHARY CHARAN SINGH UNIVERSITY, MEERUT

THREE YEARS BACHELOR OF BUSINESS ADMINISTRATION PROGRAMME

QUALIFYING PAPER

ENVIRONMENTAL STUDIES (CODE-008)

Unit-1: The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance, Need for Public Awareness.

Unit-2: Natural Resources

- Renewable and Non-renewable Resources:

Natural resources and associated problems: -

a) **Forest Resources:** use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) **Water Resources:** use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral Resources:** use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food Resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy Resources:** Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies

f) **Land Resources:** Land as a resource; land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles

Unit-3: Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: -
    a) Forest ecosystem
    b) Grassland ecosystem
    c) Desert ecosystem
    d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-4: Biodiversity And Its Conservation

- Introduction – Definition: genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity: Consumptive use, productive use, social, ethical, and aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit-5: Environmental Pollution

Definition:

- Causes, effects and control measures of: -
    a) Air pollution
    b) Water pollution
    c) Soil pollution
    d) Marine pollution
    e) Noise pollution
    f) Thermal pollution
    g) Nuclear pollution

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster Management: Floods, earthquake, cyclone and landslides.

Unit-6: Social Issues And The Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental Ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

Unit-7: Human Population And The Environment

- Population growth, variation among nations.
- Population explosion: Family Welfare Programme.
- Environment and human health
- Human Rights
- Value Education
- Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case Studies

Unit-8: Field Work

- Visit to a local area to document environmental assets-river / forest / grassland / hill / mountain.
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours).

****

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER-I

Course Code	Course Name
BCA-101	Mathematics-I
BCA-102	Programming Principle & Algorithm
BCA-103	Computer Fundamental and Office Automation
BCA-104	Principle of Management
BCA-106	Business Communication
BCA-108	Environmental Studies
BCA-105	Computer Laboratory and Practical Work of Computer Fundamental and Office Automation
BCA-107	Computer Laboratory and Practical Work of Programming Principle & Algorithm

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-101 Mathematics -I

UNIT-I

DETERMINANTS:

Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof).

UNIT-II

LIMITS & CONTINUITY:

Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

UNIT-III

DIFFERENTIATION:

Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Curve Tracing, Successive Differentiation & Liebnitz Theorem.

UNIT-IV

INTEGRATION:

Integral as Limit of Sum, Fundamental Theorem of Calculus(without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions(definition).

UNIT-V

VECTOR ALGEBRA:

Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and physical interpretation of area and volume.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-102 Programming Principle Algorithm

UNIT-I

Introduction to 'C' Language History, Structures of 'C' Programming, Function as building blocks.

Language Fundamentals Character set, C Tokens, Keywords, Identifiers, Variables, Constant, Data Types, Comments.

UNIT-II

Operators

Types of operators, Precedence and Associativity, Expression, Statement and types of statements

Build in Operators and function Console based I/O and related built in I/O function: printf(), scanf(), getch(), getchar(), putchar(); Concept of header files, Preprocessor directives: #include, #define.

UNIT-III

Control structures

Decision making structures: If, If-else, Nested If-else, Switch; Loop Control structures: While, Do-while, for, Nested for loop; Other statements: break, continue, goto, exit.

UNIT-IV

Introduction to problem solving

Concept: problem solving, Problem solving techniques (Trail & Error, Brain Stroming, Divide & Conquer) Steps in problem solving (Define Problem, Analyze Problem, Explore Solution) Algorithms and Flowcharts (Definitions, Symbols), Characteristics of an algorithm Conditionals in pseudo-code, Loops in pseudo code Time complexity: Big-Oh notation, efficiency Simple Examples: Algorithms and flowcharts (Real Life Examples)

UNIT-V

Simple Arithmetic Problems

Addition / Multiplication of integers, Determining if a number is +ve / -ve / even / odd, Maximum of 2 numbers, 3 numbers, Sum of first n numbers, given n numbers, Integer division, Digit reversing, Table generation for n, a^b, Factorial, sine series, cosine series, ${}^nC_r$, Pascal Triangle, Prime number, Factors of a number, Other problems such as Perfect number, GCD numbers etc (Write algorithms and draw flowchart), Swapping

UNIT-VI

Functions

Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-103 Computer Fundamental & Office Automation

UNIT-I

Introduction to Computers

Introduction, Characteristics of Computers, Block diagram of computer.Types of computers and features, Mini Computers, Micro Computers, Mainframe Computers, Super Computers.Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages).Data Organization, Drives, Files, Directories.Types of Memory (Primary And Secondary) RAM, ROM, PROM, EPROM.

Secondary Storage Devices (FD, CD, HD, Pen drive)

I/O Devices (Scanners, Plotters, LCD, Plasma Display)

Number Systems

Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication

UNIT-II

Algorithm and Flowcharts

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples,Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages, Examples

UNIT-III

Operating System and Services in O.S.

Dos – History, Files and Directories, Internal and External Commands, Batch Files, Types of O.S.

UNIT-IV

Windows Operating Environment

Features of MS – Windows, Control Panel, Taskbar, Desktop, Windows Application, Icons, Windows Accessories, Notepad, Paintbrush.

UNIT-V

Editors and Word Processors

Basic Concepts, Examples: MS-Word, Introduction to desktop publishing.

UNIT-VI

Spreadsheets and Database packages

Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between application, MS-PowerPoint.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-104 Principle of Management

UNIT-I

Nature of Management:

Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts of management-Administration-Organization, Management Skills, Levels of Management.

UNIT-II

Evolution of Management Thought:

Contribution of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Business Ethics & Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.

UNIT-III

Functions of Management: Part-I

Planning – Meaning- Need & Importance, types, Process of Planning, Barriers to Effective

Planning, levels – advantages & limitations. Forecasting- Need & Techniques

Decision making-Types - Process of rational decision-making & techniques of decision-making

Organizing – Elements of organizing & processes: Types of organizations, Delegation of authority – Need, difficulties Delegation – Decentralization

Staffing – Meaning & Importance, Direction – Nature – Principles, Communication – Types & Importance

UNIT-IV

Functions of Management: Part-II

Motivation – Importance – theories

Leadership – Meaning –styles, qualities & function of leader Controlling - Need, Nature, importance, Process & Techniques, Total Quality Management Coordination – Need – Importance

UNIT – V

Management of Change: Models for Change, Force for Change, Need for Change, Alternative Change Techniques, New Trends in Organization Change, Stress Management.

UNIT-VI

Strategic Management

Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India

Course Code Course Name

BCA-106 Business Communication

UNIT-I

Means of Communication:

Meaning and Definition – Process – Functions – Objectives – Importance – Essentials of good communication – Communication barriers, 7C's of Communication

UNIT-II

Types of Communication:

Oral Communication:

Meaning, nature and scope – Principle of effective oral communication – Techniques of effective speech – Media of oral communication (Face -to-face conversation – Teleconferences – Press Conference – Demonstration – Radio Recording – Dictaphone – Meetings – Rumour – Demonstration and Dramatisation – Public address system – Grapevine – Group Discussion – Oral report – Closed circuit TV). The art of listening – Principles of good listening.

UNIT-III

Written Communication

Purpose of writing, Clarity in Writing, Pricinciple of Effective writing, Writing Techniques, Electronic Writing Process.

UNIT-IV

Business Letters & Reports:

Need and functions of business letters – Planning & layout of business letter – Kinds of business letters – Essentials of effective correspondence, Purpose, Kind and Objective of Reports, Writing Reports.

UNIT-V

Drafting of business letters:

Enquiries and replies – Placing and fulfilling orders – Complaints and follow-up Sales letters – Circular letters Application for employment and resume

UNIT-VI

Information Technology for Communication:

Word Processor – Telex – Facsimile(Fax) – E-mail – Voice mail –Internet – Multimedia – Teleconferencing – Mobile Phone Conversation – Video Conferencing –SMS – Telephone Answering Machine – Advantages and limitations of these types.

Topics Prescribed for workshop/skill lab

Group Discussion, Mock Interview, Decision Making in a Group

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -II

Course Code	Course Name
BCA-201	Mathematics-II
BCA-202	C-Programming
BCA-203	Organization Behavior
BCA-204	Digital Electronics and Computer Organisation
BCA-205	Financial Accounting and Management
BCA-206	Computer Laboratory and Practical Work of C

Course Code Course Name

BCA-201 Mathematics II

UNIT-I

SETS

Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

UNIT-II

RELATIONS AND FUNCTIONS

Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Introduction of Trignometric, Logarithmic and Exponential Functions.

UNIT-III

PARTIAL ORDER RELATIONS AND LATTICES

Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, Glb, lub, Lattices & Algebric Systems, Principle of Duality, Basic Properties, Sublattices, Distributed & Complemented Lattics.

UNIT-IV

FUNCTIONS OF SEVERAL VARIABLES

Partial Differentiation, Change of Variables, Chain Rule, Extrema of Functions of 2 Variables, Euler's Theorem.

UNIT-V

3D COORDINATE GEOMETRY

3D Coordinate Geometry: Coordinates in Space, Direction Cosines, Angle Between Two Lines, Projection of Join of Two Points on a Plane, Equations of Plane, Straight Lines, Conditions for a line to lie on a plane, Conditions for Two Lines to be Coplanar, Shortest Distance Between Two Lines, Equations of Sphere, Tangent plane at a point on the sphere.

UNIT-VI

MULTIPLE INTEGRATION

Double Integral in Cartesian and Polar Coordinates to find Area, Change of Order of Integration, Triple Integral to Find Volume of Simple Shapes in Cartesian Coordinates

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-202 C Programming

UNIT-I

Arrays

Definition, declaration and initialization of one dimensional array; Accessing array elements; Displaying array elements; Sorting arrays; Arrays and function; Two-

Dimensional array: Declaration and Initialization, Accessing and Displaying, Memory representation of array [Row Major, Column Major]; Multidimensional array

UNIT-II

Pointers

Definition and declaration, Initialization; Indirection operator, address of operator; pointer arithmetic; dynamic memory allocation; arrays and pointers; function and pointers

UNIT-III

Strings

Definition, declaration and initialization of strings; standard library function: strlen(), strcpy(), strcat(), strcmp(); Implementation without using standard library functions

UNIT-IV

Structures

Definition and declaration; Variables initialization; Accessing fields and structure operations; Nested structures; Union: Definition and declaration; Differentiate between Union and structure

UNIT-V

Introduction C Preprocessor

Definition of Preprocessor; Macro substitution directives; File inclusion directives; Conditional compilation

Bitwise Operators

Bitwise operators; Shift operators; Masks; Bit field

UNIT-VI

File handling

Definition of Files, Opening modes of files; Standard function: fopen(), fclose(), feof(), fseek(),

fewind();Using text files: fgetc(), fputc(), fscanf()

Command line arguments

BCA-203 Organization Behavior

Course Code Course Name

UNIT-I

Fundamentals of Organizational Behaviour

Nature, Scope, Definition and Goals of Organizational Behaviour; Fundamental Concepts of Organizational Behaviour; Models of Organizational Behaviour; Emerging aspects of Organizational Behaviour: Meaning Cultural Diversity, Managing the Perception Process

UNIT-II

Perception, Attitude, Values and Motivation

Concept, Nature, Process, Importance, Management Behavioural aspect of Perception. Effects of employee attitudes; Personal and Organizational Values; Job Satisfaction; Nature and Importance of Motivation; Achievement Motive; Theories of Work Motivation: Maslow's Need Hierarchy Theory McGregcrs's Theory 'X' and Theory 'Y'

UNIT-III

Personality

Definition of Personality, Determinants of Personality; Theories of Personality- Trait and Type Theories, The Big Five Traites, Mytes-Briggs Indicator; Locus of Control, SType A and Type B Assessment of Personality

UNIT-IV

Work Stress

Meaning and definition of Stress, Symptoms of Stress; Sources of Stress: Individual Level, Group Level, Organizational Level; Stressors, Extra Organizational Stressors; Effect of Stress – Burnouts; Stress Management – Individual Strategies, Organizational Strategies; Employee Counselling

UNIT-V

Group Behaviour and Leadership

Nature of Group, Types of Groups; Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of Effective Leaders

UNIT-VI

Conflict in Organizations

Nature of Conflict, Process of Conflict; Levels of Conflict – Intrapersonal, Interpersonal; Sources of Conflict; Effect of Conflict; Conflict Resolution, Meaning and types of Grievances & Process of Grievances Handling.

Course Code Course Name

BCA-204 Digital electronics and Computer Organisation

UNIT-I

Logic gates and circuit

Gates (OR, AND, NOR, NAND, XOR & XNOR); Demogran's laws; Boolean laws, Circuit designing techniques (SOP, POS, K-Map).

UNIT-II

Combinational Building Blocks

Multiplexes; Decoder; Encoder; Adder and Subtracter.

UNIT-III

Memories

ROMs, PROMs, EPROMs, RAMs, Hard Disk, Floppy Disk and CD-ROM.

UNIT-IV

Sequential Building Blocks

Flip-Flop (RS, D, JK, Master-slave & & T flip-flops); Registers & Shift registers; Counters; Synchronous and Asynchronous Designing method.

UNIT-V

Memory Organization: Basic cell of static and dynamic RAM; Building large memories using chips; Associative memory; Cache memory organization and Virtual memory organization

Course Code Course Name

BCA-205 Financial Accounting & Management

UNIT-I

Overview - Meaning and Nature of Financial Accounting, Scope of Financial Accounting, Financial Accounting & Management Accounting, Accounting concepts & convention, Accounting standards in India.

UNIT-II

Basics of accounting – Capital & Revenue items, Application of Computer in Accounting Double Entry System, Introduction to Journal, Ledger and Procedure for Recording and Posting, Introduction to Trail Balance, Preparation of Final Account, Profit & Loss Account and related concepts, Balance Sheet and related concept.

UNIT-III

Financial statement analysis: Ratio analysis, Funds flow analysis, concepts, uses, Preparation of funds flow statement, simple problem, Cash flow analysis, Concepts, uses, preparation of cash flow statement, simple problem, Break – even analysis.

UNIT-IV

Definition nature and Objective of Financial Management, Long Term Sources of Finance, Introductory idea about capitalization, Capital Structure, Concept of Cost of Capital, introduction, importance, explicit & implicit cost, Measurement of cost of capital, cost of debt.

UNIT-V

Concept & Components of working Capital. Factors Influencing the Composition of working Capital, Objectives of working Capital Management – Liquidity Vs. Profitability and working capital policies. Theory of working capital: Nature and concepts

UNIT-VI

Cash Management, Inventory Management and Receivables Management.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -III

Course Code	Course Name
BCA-301	Object Oriented Programming Using C++
BCA-302	Data Structure Using C & C++
BCA-303	Computer Architecture & Assembly Language
BCA-304	Business Economics
BCA-305	Elements of Statistics
BCA-306	Computer Laboratory and Practical Work of OOPS
BCA-307	Computer Laboratory and Practical Work of DS

Course Code Course Name

BCA-301 Object Oriented programming language

UNIT-I

Introduction

Introducing Object – Oriented Approach, Relating to other paradigms {Functional, Data decomposition}.

Basic terms and ideas

Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete, operators.

UNIT-II

Classes and Objects

Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State idendity and behaviour of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass / abstract classes.

UNIT-III

Inheritance and Polymorphism

Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parameteric Polymorphism

UNIT-IV

Generic function

Template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

UNIT-V

Files and Exception Handling

Streams and files, Namespaces, Exception handling, Generic Classes

Course Code Course Name

BCA-302 Data Structure Using C & C++

UNIT-I

Introduction to Data Structure and its Characteristics Array

Representation of single and multidimensional arrays; Sprase arrays – lower and upper triangular matrices and Tridiagonal matrices with Vector Representation also.

UNIT-II

Stacks and Queues

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

UNIT-III

Lists

Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion searching, Two way lists and Use of headers

UNIT-IV

Trees

Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree

UNIT-V

B-Trees

Introduction, The invention of B-Tree; Statement of the problem; Indexing with binary search trees; a better approach to tree indexes; B-Trees; working up from the bottom; Example for creating a B-Tree

UNIT-VI

Sorting Techniques; Insertion sort, selection sort, merge sort, heap sort, searching Techniques: linear search, binary search and hashing

Course Code Course Name

BCA-303 Computer Architecture & Assembly Language

UNIT-I

Basic computer organization and design, Instructions and instruction codes, Timing and control/ instruction cycle, Register/ Types of register/ general purpose & special purpose registers/ index registers, Register transfer and micro operations/ register transfer instructions, Memory and memory function, Bus/ Data transfer instructions, Arithmetic logic micro-operations/ shift micro-operations, Input/ Output and interrupts, Memory reference instructions, Memory interfacing memory/ Cache memory.

UNIT-II

Central Processing Unit

General Register Organization/ stacks organizations instruction formats, addressing modes, Data transfer and manipulation. Program control reduced computer, pipeline/ RISC/ CISC pipeline vector processing/ array processing.

Arithmetic Algorithms: Integer multiplication using shift and add, Booth's algorithm, Integer division, Floating-point representations.

UNIT-III

Computer Arithmetic

Addition, subtraction and multiplication algorithms, divisor algorithms. Floating point, arithmetic operations, decimal arithmetic operations, decimal arithmetic operations.

UNIT-IV

Input – Output Organization

Peripheral devices, Input/output interface, ALU Asynchronous Data transfer, mode of transfer, priority interrupts, Direct memory Address (DMA), Input/ Output processor (IOP), serial communication.

UNIT-V

Evaluation of Microprocessor

Overview of Intel 8085 to Intel Pentium processors Basic microprocessors, architecture and interface, internal architecture, external architecture memory and input/ output interface.

UNIT-VI

Assembly language, Assembler, Assembly level instructions, macro, use of macros in I/C instructions, program loops, programming arithmetic and logic subroutines, Input-Output programming.

Course Code Course Name

BCA-304 Business Economics

UNIT-I

The Scope and Method of Economics, the Economic Problem: Scarity & Choice, The Price Mechanism, Demand & Supply Equilibrium: The Concept of Elasticity and it's Applications.

The Production Process: output decisions – Revenues Costs and Profit Maximisation

Laws of returns & Returns to Scale: Economics and Diseconomies of scale.

UNIT-II

Market Structure: Equilibrium of a firm and Price, Output Determination under Perfect Competition Monopoly, Monoplastic Competition & Oligopoly

UNIT-III

Macro Economic Concerns

Inflalation, Unemployment, Trade-Cycles, Circular Flow upto Four Sector Economy, Government in the Macro Economy: Fiscal Policy, Monetary Policy, Measuring national Income and Output

UNIT-IV

The World Economy – WTO, Globalisation, MNC's, Outsourcing, Foreign Capital in India, Trips, Groups of Twenty (G-20), Issues of dumping, Export-Import Policy 2004-2009

Course Code Course Name

BCA-305 Elements of Statistics

UNIT-I

Population, Sample and Data Condensation

Definition and scope of statistics, concept of population and simple with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

UNIT-II

Measures of Central Tendency

Concept of central Tendency, requirements of a good measures of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data.

UNIT-III

Measures of Dispersion:

Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation.

UNIT-IV

Permutations and Combinations

Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions). ${}^{n}P_{r}$ = n!/(n-r) !(without proof). Combinations of 'r' objects taken from 'n' objects. ${}^{n}C_{r}$ = n!/(r!(n-r)!) (without proof) . Simple examples, Applications.

UNIT-V

Sample space, Events and Probability

Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples.

Classical definition of probability, Addition theorem of probability without Proof (upto three events are expected). Definition of conditional probability Definition of independence of two events, simple numerical problems.

UNIT-VI

Statistical Quality Control

Introduction, control limits, specification limits, tolerance limits, process and product control; Control charts for X and R; Control charts for number of defective {n-p chart} ,control charts for number of defects {c - chart}

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -IV

Course Code	**Course Name**
BCA-401	Computer Graphics & Multimedia Application
BCA-402	Operating System
BCA-403	Software Engineering
BCA-404	Optimization Techniques
BCA-405	Practical Based on Subject Code -401.
BCA-406	Mathematics-III

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-401 Computer Graphics & Multimedia Application

UNIT-I

Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Application Development of Hardware and software for computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan: Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

UNIT-II

Hardcopy Technologies, Display Technologies, Raster-Scan Display System, Video

Controller, Random-Scan Display processor, Input Devices for Operator Interaction, Image Scanners, Working exposure on graphics tools like Dream Weaver, 3D Effects etc,

Clipping

Southland- Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm

UNIT-III

Geometrical Transformation

2D Transformation, Homogeneous Coordinates and Matrix Representation of 2D Transformations, composition of 2D Transformations, the Window-to-Viewport Transformations, Introduction to 3D Transformations Matrix.

UNIT-IV

Representing Curves & Surfaces

Polygon meshes parametric, Cubic Curves, Quadric Surface;

Solid Modeling

Representing Solids, Regularized Boolean Set Operation primitive Instancing Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry Comparison of Representations.

UNIT-V

Introductory Concepts: Multimedia Definition, CD-ROM and the multimedia highway, Computer Animation (Design, types of animation, using different functions) UNIT-VI

Uses of Multimedia, Introduction to making multimedia – The stage of Project, hardware & software requirements to make good multimedia skills and Training opportunities in Multimedia Motivation for Multimedia usage

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-402 **Operating System**

UNIT-I

Introduction, What is an operating system, Simple Batch Systems, Multi-programmed Batch systems, Time- Sharing Systems, Personal – Computer Systems, Parallel systems, Distributed

systems, Real- Time Systems**.**

Memory Management: Background, Logical versus physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page- replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations

UNIT-II

Processes: Process Concept, Process Scheduling, Operation on Processes

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple – Processor Scheduling.

Process Synchronization: Background, The Critical – Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

UNIT-III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT-IV

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap- Space Management, Disk Reliability

UNIT-V

Information Management: Introduction, A Simple File system, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File system File – System Interface; File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File – System Implementation: File – System Structure, Allocation Methods, Free- Space Management

Course Code Course Name

BCA-403 Software Engineering

UNIT-I

Software Engineering: Definition and paradigms, A generic view of software engineering.

UNIT-II

Requirements Analysis: Statement of system scope, isolation of top level processes and entitles and their allocation to physical elements, refinement and review.

Analyzing a problem, creating a software specification document, review for correctness, consistency, and completeness.

UNIT-III

Designing Software Solutions: Refining the software Specification; Application of fundamental design concept for data, architectural and procedural designs using software blue print methodology and object oriented design paradigm; Creating design document: Review of conformance to software requirements and quality.

UNIT-IV

Software Implementation: Relationship between design and implementation, Implementation issues and programming support environment, Coding the procedural design, Good coding style and review of correctness and readability.

UNIT-V

Software Maintenance: Maintenance as part of software evaluation, reasons for maintenance, types of maintenance (Perceptive, adoptive, corrective), designing for maintainability, techniques for maintenance.

UNIT-VI

Comprehensive examples using available software platforms/case tools, Configuration Management.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-404 **Optimization Techniques**

UNIT-I

Linear programming

Central Problem of linear Programming various definitions included Statements of basic theorem and also their properties, simplex methods, primal and dual simplex method, transport problem, tic-tac problem, and its solution. Assignment problem and its solution. Graphical Method Formulation, Linear Programming Problem.

UNIT-II

Queuing Theory

Characteristics of queuing system, Classification of Queuing Model Single Channel Queuing Theory, Generalization of steady state M/M/1 queuing models(Model-I, Model-II).

UNIT-III

Replacement Theory

Replacement of item that deteriorates replacement of items that fail. Group replacement and individual replacement.

UNIT-IV

Inventory Theory

Cost involved in inventory problem- single item deterministic model economics long size model without shortage and with shorter having production rate infinite and finite.

UNIT-V

Job Sequencing

Introduction, solution of sequencing problem Johnson s algorithm for n jobs through 2 machines

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-405 Mathematics –III

UNIT-I

COMPLEX VARIABLES: Complex Number System, Algebra of Complex Numbers, Polar Form, Powers and Roots, Functions of Complex Variables, Elementary Functions, Inverse Trigonometric Function.

UNIT-II

SEQUENCE, SERIES AND CONVERGENCE: Sequence, Finite and Infinite Sequences, Monotonic Sequence, Bounded Sequence, Limit of a Sequence, Convergence of a Sequence, Series, Partial Sums, Convergent Series, Theorems on Convergence of Series (statement, alternating series, conditional convergent), Leibnitz Test, Limit Comparison Test, Ratio Test, Cauchy's Root Test, Convergence of Binomial and Logarithmic Series, Raabe's Test, Logarithmic Test, Cauchy's Integral Test (without proof)

UNIT-III

VECTOR CALCULUS: Differentiation of Vectors, Scalar and Vector Fields, Gradient, Directional Derivatives, Divergence and Curl and their Physical Meaning.

UNIT-IV

FOURIER SERIES: Periodic Functions, Fourier series, Fourier Series of Even and Odd Functions, Half Range Series.

UNIT-V

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Variable - Separable Method, Homogeneous Differential Equations, Exact Differential Equations, Linear Differential Equations, Bernoulli's Differential Equations, Differential Equations of First Order and First Degree by Integrating Factor.

UNIT-VI

ORDINARY DIFFERENTIAL EQUATIONS OF SECOND ORDER: Homogenous Differential Equations with Constant Coefficients, Cases of Complex Roots and Repeated

Roots, Differential Operator, Solutions by Methods of Direct Formulae for Particular Integrals, Solution by Undetermined Coefficients, Cauchy Differential Equations, (only Real and Distinct Roots) Operator Method for Finding Particular Integrals, (Direct Formulae).

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

SEMESTER -V

Course Code	**Course Name**
BCA-501	Introduction to DBMS
BCA-502	Java Programming and Dynamic Webpage Design
BCA-503	Computer Network
BCA-504	Numerical Methods
BCA-508	Minor Project
BCA-507	Viva-Voice on Summer Training
BCA-505	Computer Laboratory and Practical Work of DBMS
BCA-506	Computer Laboratory and Practical Work of Java Programming & Dynamic Webpage Design

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-501 **Introduction to DBMS**

UNIT-I

Introduction: Characteristics of database approach, data models, DBMS architecture and data independence.

UNIT-II

E-R Modeling: Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization.

UNIT-III

File Organization: Indexed sequential access files; implementation using B & B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance.

UNIT-IV

Relational Data Model: Relational model concepts, relational constraints, relational alzebra

SQL: SQL queries, programming using SQL.

UNIT-V

EER and ER to relational mapping: Data base design using EER to relational language.

UNIT-VI

Data Normalization: Functional Dependencies, Normal form up to 3rd normal form.

Concurrency Control: Transaction processing, locking techniques and associated, database recovery, security and authorization. Recovery Techniques, Database Security

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA- 502 **Java Programming and Dynamic Webpage Design**

UNIT-I

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, package, exception handling) multithreaded programming.

UNIT-II

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions)

UNIT-III

Networking (datagram socket and TCP/IP based server socket) event handling, JDBC:

Introduction, Drivers, Establishing Connection, Connection Pooling.

UNIT-IV

HTML: use of commenting, headers, text styling, images, formatting text with <FONT>, special characters, horizontal rules, line breaks, table, forms, image maps, <META> tags, <FRAMESET> tags, file formats including image formats.

UNIT-V

Java Servlets: Introduction, HTTP Servlet Basics, The Servlet Lifecycle, Retrieving Information, Sending HTML Information, Session Tracking, Database Connectivity

UNIT-VI

Java Server Pages: Introducing Java Server Pages, JSP Overview, Setting Up the JSP Environment, Generating Dynamic Content, Using Custom Tag Libraries and the JSP Standard Tag Library, Processing Input and Output

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-503 **Computer Network**

UNIT-I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks. **OSI and TCP/IP Models:** Layers and their functions, comparison of models.

Digital Transmission: Interfaces and Modems: DTE-DCE Interface, Modems, Cable modems.

UNIT-II

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media

UNIT-III

Telephony: Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching.

Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.

Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP. **ISDN:** Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN. **UNIT-IV**

Devices: Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internetworking, Network-Layer in the internet.

UNIT-V

Transport and upper layers in OSI Model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code **Course Name**

BCA-504 **Numerical Methods**

UNIT-I

Roots of Equations: Bisections Method, False Position Method, Newton's Raphson Method, Rate of convergence of Newton's method.

UNIT-II

Interpolation and Extrapolation : Finite Differences, The operator E, Newton's Forward and Backward Differences, Newton's dividend differences formulae, Lagrange's Interpolation formula for unequal Intervals, Gauss's Interpolation formula, Starling formula, Bessel's formula, Laplace-Everett formula.

UNIT-III

Numerical Differentiation Numerical Integration : Introduction, direct methods, maxima and minima of a tabulated function, General Quadratic formula, Trapezoidal rule, Simpson's One third rule, Simpson's three- eight rule.

UNIT-IV

Solution of Linear Equation: Gauss's Elimination method and Gauss's Siedel iterative method.

UNIT-V

Solution of Differential Equations: Euler's method, Picard's method, Fourth-order Ranga – Kutta method.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise
SEMESTER -VI

Course Code	Course Name
BCA-601	Computer Network Security
BCA-602	Information System: Analysis Design & Implementation
BCA-603	E-Commerce
BCA-604	Knowledge Management
BCA-605	Major Project
BCA-606	Presentation/Seminar based on Major Project

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-601 Computer Network Security

UNIT-I

Introduction: Attack, Services and Mechanism, Model for Internetwork Security.

Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

UNIT-II

Network Security:

Authentication Application: Kerveros, X.509, Directory Authentication Service, Pretty Good Privacy, S/Mime.

UNIT-III

IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load combining Security Associations, Key Management.

UNIT-IV

Web Security: Requirement, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

UNIT-V

Network Management Security: Overview of SNMP Architecutre-SMMPVI1 Communication Facility, SNMPV3.

UNIT-VI

System Security: Intruders, Viruses and Relate Threats, Firewall Design Principles. Comprehensive examples using available software platforms/case tools, Configuration Management.

Course Code Course Name

BCA-602 Information System Analysis Design and Implementation

UNIT-I

Overview of System Analysis and Design: Systems Development Life Cycle; concept and Models: requirements determination, logical design, physical design, test planning, implementation, planning and performance evaluation, communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group based approaches, JAD, structures walkthroughs, and design and code reviews; prototyping; database design software quality metrics; application categories software package evaluation and acquisition.

UNIT-II

Information Requirement Analysis: Process modeling with physical logical data flow diagrams, data modeling with logical entity relationship diagrams.

UNIT-III

Developing a Proposal: Feasibility study and cost estimation.

System Design: Design of input and control, design of output and control, file design/database design, process, user interface design, prototyping; software constructors; documentation.

UNIT-IV

Application Development Methodologies and CASE tools: Information engineering structured system analysis and design, and object oriented methodologies for application development data modeling, process modeling, user interface design, and prototyping, use of computer aided software engineering (CASE) tools in the analysis design and implementation of information systems.

UNIT-V

Design and Implementation on OO Platform: Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional object oriented design and object oriented programming systems for implementation, object oriented data bases.

UNIT-VI

Managerial issues in Software Projects: Introduction to software markets; planning of software projects, size and cost estimates; project scheduling; measurement of software quality and productivity, ISO and capability maturity models for organizational growth.

Course Code Course Name

BCA-603 E-Commerce

UNIT-I

Introduction to E-Commerce: The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage Sustainable Competitive Advantage, Competitive Advantage using E -Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

UNIT-II

Business-to-Business Electronic Commerce: Characteristics of B2B EC, Models of B2B Ec,

Procurement Management Using the Buyer's Internal Marketplace, Just in Time Delivery, Other

B2B Models, Auctions and Services from Traditional to Internet Based EDI, Intergration with

Back-end Information System, The Role of Software Agents for B2B EC, Electronic marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

UNIT-III

Internet and Extranet : Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet and Extranet, Intranet software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The structures of Extranets, Extranet products & services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

Electronic Payment Systems : Is SET a failure, Electronic Payments & Protocols, Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet, Electronic Fund transfer and Debit cards on the Internet, Stored – value Cards and E- Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

UNIT-IV

Public Policy: From Legal Issues to Privacy : EC- Related Legal Incidents, Legal Incidents, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection In EC.

UNIT-V

Infrastructure For EC : It takes more than Technology, A Network Of Networks, Internet Protocols, Web- Based client/ Server, Internet Security, selling on the web, Chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial Issues.

C.C.S. University, Meerut.
Bachelors of Computer Application
Semester – wise

Course Code Course Name

BCA-604 Knowledge Management.

UNIT-I

Business Intelligence and Business Decisions: Modeling Decision Process; Decision support systems; Group decision support and Groupware Technologies.

UNIT-II

Executive Information and support Systems: Business Expert System and AI, OLTO & OLAP; Data Warehousing; Data Marts, Data Warehouse architecture; Tools for data warehousing.

UNIT-III

Multi- Dimensional analysis: Data mining and knowledge discovery; Data mining and Techniques; Data mining of Advance Databases.

UNIT-IV

Knowledge Management Systems: Concept and Structure KM systems, techniques of knowledge management appreciation & limitation.

CH. CHARAN SINGH UNIVERSITY, MEERUT
BACHELOR OF COMMERCE

SYLLABUS
(Effective from Academic Year 2018-19 onwards)

CH. CHARAN SINGH UNIVERSITY, MEERUT

CH. CHARAN SINGH UNIVERSITY, MEERUT
B.COM SYLLABUS (2018-19 and onwards)

Year : I

CODE NO.	TITLE OF PAPER / COURSE	EXTERNAL MARKS
C-101	BUSINESS COMMUNICATION	100
C-102	BUSINESS STATISTICS	100
C-103	FINANCIAL ACCOUNTING	100
C-104	BUSINESS REGULATORY FRAMEWORK	100
C-105	BUSINESS ECONOMICS	100
C-106	BUSINESS ENVIRONMENT	100
	Total	600

Year: II

CODE NO.	TITLE OF PAPER/COURSE	EXTERNAL MARKS
C- 201	COMPANY LAW	100
C- 202	COST ACCOUNTING	100
C- 203	PRINCIPLES OF BUSINESS MANAGEMENT	100
C-204	INCOME TAX	100
C-205	FUNDAMENTALS OF ENTREPRENEURSHIP	100
C-206	PUBLIC FINANCE	100
	TOTAL	

Year: III

CODE NO.	TITLE OF PAPER/COURSE	EXTERNAL MARKS
C- 301	CORPORATE ACCOUNTING	100
C- 302	AUDITING	100
C- 303	PRINCIPLES OF MARKETING	100
C-304	ECONOMIC LAWS	100
C-305	E-COMMERCE	100
C-306	MANAGEMENT ACCOUNTING	100

B.COM. I YEAR
PAPER – I
BUSINESS COMMUNICATION (C-101)

Objective

The objective of this course is to develop effective business communication skills among the students.

Course Inputs:

Unit I: Introducing business communication: Basic forms of communicating; Communication models and process; Effective communication; Theories of communication; Audience analysis; Principles of effective communication

Unit III: Self – Development and Communication: Development of positive personal attitudes; SWOT analysis; Vot's model of interdependence; Whole communication.
Corporate communication: Formal and in informal communication networks; Grapevine; Miscommunication(Barriers),Improving communication. Practices in business communication; Group discussions; Mock interviews; Seminars; Effective listening exercises; Individual and group presentations and Reports writing.

Unit III: Writing skills : Planning business messages; Rewriting and editing; The first draft; Reconstructing the final draft; Business letters and memo formats; Appearance; Persuasive letters; sales letters; collection letters; office memorandum.
Report writing: Introduction to a proposal, short report and formal report, Report preparation. Oral presentation; Principles of oral presentation, Factors affecting presentation, Sales presentation, Training presentation, Conducting surveys, speeches to motivate, Effective presentation skills

Unit IV: Non –verbal aspects of communicating: Body language; kinesics proxemics, Para language. Effective listening; Principles of effective listening; Factors affecting listening exercise; oral written and video session
Interviewing skills: Appearing in interviews; Conducting interviews; Writing resume and letter of application.

Unit V: Modern Forms of Communicating: Fax; E-mail; Video conferencing; etc. International Communication: Cultural sensitiveness and cultural context; Writing and presenting in international situations; Inter-cultural factors in interactions; Adapting to global business.

PAPER – II
BUSINESS STATISTICS (C-102)

Objective

The purpose of the paper is to inculcate and analytical ability among the students

Unit I: Introduction: Meaning, Scope, Importance and limitation of statistics. Statistical investigation: Planning of statistical investigation, Census data, Statistical errors and approximation, Classification and tabulation of data frequency distribution.

Unit II: Statistical Average: Arithmetic, Geometric and harmonic means, Mode median, Qualities and percentiles, Simple and weighted averages. Uses and limitation of different averages.

Unit III: Dispersion and skewness : Range quartile deviation mean, Deviation and their coefficients, Standards deviation coefficient of variation skewness and its coefficiants.

Unit IV: Correlation : Karl parson's coefficient of correlation, Probable error and interpretation of coefficient of correlation rank difference method and concurrent deviation method

Unit V: Analysis of time series: component of time series, Calculation of secular trend– moving average method and method of least squares. Index numbers: Utility of index numbers problems in the construction of index numbers simple and weighted index numbers, base shifting fishers ideal index numbers and tests of reversibility

PAPER – III
FINANCIAL ACCOUNTING (C-103)

Objective

To import basic accounting knowledge as applicable to business

Course Inputs:

Unit I: Introduction to Accounting standards and IFRS, Human Resource Accounting, Inflation Accounting and Responsibility Accounting Theoretical concept only.

Unit II: Insolvency Accounts: Individual & Partnership firm (as per IBC_2016)

Unit III: Branch Accounts: Dependent Branch; Debtors system, Stock and debtors system; Final accounts system;Wholesale branch; Independent branch; Foreign branch; Departmental Accounts.

Unit IV: Hire – purchase and installment purchase system; Meaning of hire – purchase contract; legal provision regarding hire – purchase contract; Accounting records for goods of substantial sale values, and Accounting records for goods of small values ; Installment purchase system; After sales services.

Unit V: Royalties Accounts : Insurance claims

PAPER – IV
BUSINESS REGULATORY FRAMEWORK (C-104)

Objective

The objective of this course is to provide a brief idea about the frame work of Indian business laws.

Unit I: The Indian Contract Act, 1872 : Nature of contract classification; Offer and acceptance; Capacity of parties to contract; Free consent; Consideration legality of object; agreement declared vaid; Performance of contract; Discharge of contract; Remedies for breach of contract.

Unit II: Special contract: Indemnity; Guarantee; Bailment and pledge; Agency.

Unit III: Sale of goods act 1930 : Formation of contracts of sale ; Goods and their classification, Price; Condition, And warranties; Transfer of property in goods; Performance of the contract of sale; Unpaid seller and his rights, Sale by auction; Hire purchase agreement.

Unit IV: The consumer protection Act 1986 : Silent feature definition of consumer; Grievance redressal machinery.

Unit V: Limited liability partnership Act – 2008

PAPER – V
BUSINESS ECONOMICS (C-105)

Objective

This course in meant to acquaint the student with the principles of business economics as are applicable in business

Unit I: Introduction : Basic problems of an economy working of price mechanism.

Unit II: Elasticity of demand : Concept and measurement of elasticity of demand; Price, Income and cross Elasticities; Average revenue, Marginal revenue, And elasticity of Demand; Determinants of elasticity of demand; Importance of elasticity of demand

Unit III: Production function: Law of variable properties iso–quants; Economic regions and optimum factor combination; Expansion path; Return to scale; Internal and external economics and diseconomies; Ridge lines.
Theory of Costs: Short-run and long-run cost curves- Traditional and modern approaches.

Unit IV Market structure : Market structure and business decisions; Objectives of a business firm a perfect competition; Profit maximization and equilibrium of firm and indust short rum and long rum supply curves; Price and output determination practical applications. Monopoly; Determination of price under monopoly; Equilibrium of a firm; Comparison between perfect competition and monopoly; Multi-plant monopoly; Price discrimination. Practical application.

Unit V: a. Monopolistic competition: Meaning and characteristic; Price and output Determination under monopolistic competition; Product differentiation; selling costs; Comparison with perfect competition; Excess capacity under monopolistic competition.

b. Oligopoly: Characteristics indeterminate pricing and output; Classical models of oligopoly; Price leadership; Collusive oligopoly; Kinked demand curve.

PAPER – VI
BUSINESS ENVIRONMENT (C-106)

Objective

This course aims acquainting the students with the emargiong issue in business at the national and international level in the light of the policies of liberalization and globalization.

Unit I: Indian business environment: Concept, Components, and Importance

Unit II : Economic trend (overviews) : Income; Savings and investment; Industry; Trade and balance of payments, Money; Finance, Prices.

Unit III : Problems of growth : Unemployment; Poverty; Regional imbalances; Social injustics; Inflation paralled economy; Industrial sickness

Unit IV: Role of Government : Monetary and fiscal policy; Industrial policy; Industrial licensing Privatization; Devolution export – import policy; Regulation of foreign investment.

Unit V: Niti Aayog : Philosophy, Function and role of niti aayog.

B.COM. II
PAPER – I
COMPANY LAW (C-201)

PROVISIONS OF THE COMPANIES ACT, 2013 AND AMENDMENTS UP TO DATE RELATING to

Unit -1: Introduction to Companies Act, 2013; Important Definitions; Incorporation of a company and matters incidental thereto
(Relevant section 1 to 22)

Unit -2: Prospectus and Allotment of Securities- Public Offer & Private Placement; Share Capital & Debentures; Acceptance of Deposits by Companies; Registration of charges.
(Relevant section 23 to 87)

Unit -3: Management & Administration – Register of Members, Annual Returns, Annual General Meeting, Extra –ordinary General Meeting; Declarations and Payment of Dividend ; Accounts and Audit of Companies.
(Relevant section 88 to 148)

Unit - 4: Directors –Appointment & Qualification; Meeting of Board and its powers; Prevention of oppression & Mismanagement.
(Relevant section 149 to 195) & **(Relevant section 241to 246)**

Unit - 5: Winding up – Modes of winding up, Winding up by Tribunal, Voluntary winding up, Official Liquidator
(Relevant section 270 to 365)

PAPER – II
COST ACCOUNTING (C-202)

Objective

This course exposes the students to the basic concepts and the tools used in cost accounting.

Course Inputs:

Unit I: Introduction: Nature and scope of cost accounting; Cost concepts and classification; Methods and techniques; Installation of costing system; Concept of cost audit.

Unit II: Basics of Material, Labour and Overhead cost:

a. Concept of Material, Pricing of material issues; Treatment of material losses.
b. Labour turnover ;Idle time and overtime; Methods of wage payment-time and piece rates;
c. Classification and departmentalization of overhead, Absorption of overheads; Determination of overhead rates; Machine hour rate.

Unit III: Cost Ascertainment: Unit costing; Operating costing.

Unit IV: Job, Batch and Contract costing; Process costing including inter-process profit; Joint and By product.

Unit V: Cost Records: Integral and non-integral system; Reconciliation of cost and financial accounts.

PAPER – III
PRINCIPLES OF BUSINESS MANAGEMENT (C-203)

Objective

This course familiarizes the student with the basics of principles of management.

Course Inputs:

Unit I: Introduction : Concept, nature process and significance of management ; Managerial roles (Mintzberg); An overview of functional areas of management. Development of management thought ; Classical and nco-classical system : Contingency approaches.

Unit II: Planning : Concept, process , Types. Decision making- concept and process; Bounded rationality ; Management by objective ; Corporate planning ; Environment analysis and diagnosis ; Strategy formulation.

Unit III: Organizing : Concept, nature, process, and significance; Authority and responsibility relationship.

Unit IV: Motivating and Leading People at work : Motivation – concept; Theories-Maslow, Herzberg, McGregor, and Quchi; Financial and non-financial incentives. Leadership – concept and leadership styles; Leadership theories (Trannenbaum and Schmidt.); Likert's System Management; Communication-nature process, Network and barriers; Effective communication.

Unit V: Managerial Control: Concept and process; Effective control system; Techniques of control –traditional and modern.

PAPER – IV
INCOME TAX (C-204)

Objective

It enables the students to know the basics of Income Tax and its implications.

Course Inputs:

Unit I: Basis Concept: Income, Agricultural income, Casual income, Assessment year, Previous year, Gross total income, person; Tax evasion, Avoidance and tax planning.

Unit II: Basis of Charge: Scope of total income, Residence and tax liability, Income which does not form part of total income.

Unit III: Heads of Income: Salaries; Income from house property; Profit and gains of business or profession, Including provision relating to specific business; Capital gains; Income from other sources.

Unit IV: Computation of Tax Liability: Computation of total income and tax liability of an individual Aggregation of income; Set-off and carry forward of losses; Deduction from gross total income.

Unit V: Tax Management: Tax deduction at source; Advance payment of tax; Assessment procedures; IT Authorities.

PAPER – V
FUNDAMENTALS OF ENTREPRENEURSHIP (C-205)

Objective

It provides exposure to the students to the entrepreneurial culture and industrial growth so as to preparing them to set up and manage their own small units.

Course Inputs:

Unit I : Introduction : The entrepreneur ; Definition ; Emergence of entrepreneurial class; Theories of entrepreneurship ; Role of socio-economic environment ; Characteristics of entrepreneur ; Leadership; Risk taking ; Decision-making and business planning.

Unit II: Promotion of a Venture: Opportunities analysis; External environmental analysis-economic, social, and technological; Competitive factors; Legal requirements for establishment of a new unit, And raising of funds; Venture capital sources and documentation required.

Unit III: Entrepreneurial Behaviour: Innovation and entrepreneur; Entrepreneurial behavior and Psycho-Theories , Social responsibility.

Unit IV: Entrepreneurial Development Programmes (EDP): EDP, Their role, Relevance, And achievements; Role of Government in organizing EDPs; Critical evaluation.

Unit V: Role of Entrepreneur: Role of an entrepreneur in economic growth as an innovator, Generation of employment opportunities, Complimenting and supplementing economic growth, Brining stability and balanced regional development of industries; Role in export promotion and import substitution, Forex earning, and augmenting and meeting local demand.

PAPER – VI
PUBLIC FINANCE (C-206)

Objective

The objective of this course is to provides basic knowledge about various intricacies for Public finance

Course Inputs:

Unit I: Meaning & Scope of Public Finance Public Finance Vs Private Finance, Principle of Maximum Social Advantage, Public Budget, Techniques of Budgeting (ZBB PBB), Deficit Financing.

Unit II: Public Expenditure: Meaning & Nature Wanger's views on increasing state activities Wiseman-peacock hypothesis, Cannons and classification of public expenditure effects on production, Distribution and economic stability.

Unit III: Public Revenue: Main sources of revenue, Tax revenue, Direct and Indirect Taxes, Progressive, Proportional & Regressive Taxes, Value added tax, The Division of tax burden, Incidence of a tax, Effect on production & distribution

Unit IV: Public Debts: Role and classification of Public debts and methods of their redemption.

Unit V: Indian Public Finance: Financial Federalism under constitution, Financial Adjustment in India, Finance Commission, Review of Indian Tax System Budgetary Procedure and Financial Control in India.

B.COM. III
(PAPER – I)
CORPORATE ACCOUNTING (C-301)

Objective

This course enable the students to develop awareness about corporate accounting in conformity with the provisions of companies Act.

Course Input

Unit I: Issue of Shares and Debentures: Issue, Forfeiture and re-issue of shares, Redemption of preference shares; Issue and redemption of debentures

Unit II : Accounting for special issue : Bonus issue, Employee's stock option plan, Buy back of shares.

Unit III : Valuation of goodwill and shares, Underwriting of shares .

Unit IV: Final accounts :As per latest format Prescribed under companies Act, 2013.

Unit V: Consolidated balance sheet of holding companies with one subsidiary only.

PAPER – II
AUDITING (C-302)

Objective

This course aims at imparting knowledge about the principal and methods or auditing and their applications .

Course Inputs

Unit I : Introduction: Meaning and objective of auditing; Types of audit; Audit programme; Audit notebooks; Working papers and evidences; Consideration for commencing an audit; Routine checking and test checking; Internal check system; Internal audit and Internal control.

Unit II: Audit Procedure: Vouching; Verification of assets and liabilities.

Unit III: Audit of companies: Company auditor appointment, Powers, Duties and Liabilities. Removal of auditor as per provision of the companies Act 2013

Unit IV: Auditor's report-clean report and qualified report.

Unit V: Recent trends in auditing: Nature and significance of cost audit; Tax audit, management audit.

PAPER – III
PRINCIPLES OF MARKETING (C-303)

Objective The objective of this course is to help students understand the concept of marketing and its applications.

Course Inputs

Unit I. Introduction: Nature and scope of marketing; Importance of marketing as a business function and in the economy; Marketing concept: Traditional and modern; Selling vs. marketing; Marketing mix; Marketing environment.

Unit II. Consumer Behavior and market Segmentation: Nature, Scope, And significance of consumer behavior; Market segmentation- concept and importance; Bases for market segmentation.

Unit III. Product: Concept of product, Consumer and industrial goods, Product planning and development; Packaging. Role and Functions; Brand name and trade market; After sales service; Product life cycle concept.
Price : Importance of price in the marketing mix; Factors affecting Price of a product/service; Discounts and rebates.

Unit IV. Distributions channels and physical Distribution: Distribution channels- Concept and role; Types of distribution channels; Factors affecting choice of a distribution channel; Retailer and wholesaler. Promotion Methods of promotion; Optimum Promotion mix; Advertising media-their relative merits and limitation; Characteristics of an affective advertisement; Personal Selling as a career.

Unit V. International Marketing: Nature, Definition and scope of international marketing; Domestic marketing vs. international marketing; International marketing environment –external and inernal.

Identifying and selecting foreign market: Foreign market entry mode decisions.

PAPER – IV
ECONOMIC LAWS (C-304)

Objective It will provide a basic knowledge of Economic laws to the learners.

Unit I: Securities Laws: SEBI Act, 1992; Depositories Act. 1996.

Unit II: Environmental Laws: The Environment Protection Act, 1986; water (Prevention &. control of pollution) Act, 1974, Air (Prevention control of Pollution) Act, 1981; NGT Act, 2010

Unit III. IPR Laws: Trade Market Act, 1999; Patents 1970 The designs Act 2000; Indications of Goods (Registration & Protection) Act, 1999; copy right Act, 1957

Unit IV: Foreign exchange & Anti-corruption Laws: FEMA 1999; Prevention of Money Laundering Act, 2002.

Unit V: Industrial Laws: Factoreis Act 1948 ; Industrial Disputes Act, 1947.

PAPER – V
E-COMMERCE (C-305)

Objective : To enable the student to become competent to under stand the mechanism for excelling in E Commerce based employment and self-employment oppotunties.

Unit I. Introduction : Introduction to E commerce and Definition, E-commerce based activities, Goals of E-commerce, Technical components of E-commece, Functions, Advantages and disadvantages of E-commerce Scape of E-commerce, Electronic commerce Application Frame work of E-commerce, Supply chain Management Electronic commerce and Electronic Business.

Unit II: Planning on-line Business: Nature and dynamics of the internet. Electronic business models: B2B, B2C, C2C, C2B, website Design : Websites as market place E-commerce, Pure online vs. brick and click business; Assessing requirement for an online business desiging developing and deplaying the system.

Unit III: Technology for online-Business: Internet and its Evolution, It Infrastructure, Middleware Domain names, Contents : Text and integrating E-business applications. component of internet information technology structure, Development of internet, Extranet and their Differnence.

Unit IV: Operations of E-commerce: online-payment mechanism; Electronic Payment system; Payment Gateways; Visitors to website ; Tools for promoting websites; Risk management option for e-Payment Systems.

Unit V: Security and legal Aspects of E-commerce: Threats in E-commerce, Security of clients and Service-Provider, Cyber Laws-Relevant Provisions of information Technology Act 2000, offences, Secure electronic records and digital signatures Penalties and adjudication.

PAPER – VI
MANAGEMENT ACCOUNTING (C-306)

Objective : To enable the students to understand the practical knowledge of decision making accounting Which is related to the management.

Unit I: In**troduction:** Meaning, Nature, Scope and Function of management Accounting; Role of Accounting ;Management Accounting Vs. Financial Accounting ;Tools and Techniques of management Accounting.

Unit II: Budgetory Control ; Meaning of Budget, Budgeting and budgetory control; Objectives ,Merits and limitations of budgetary control; Types of budget: Fixed and flexible budget; Zerobard Budget ;Performance budgeting.

Unit III : Funds flow and cash flow analysis ; Ratio analysis funds flow analysis and cash flow analysis as per accounting standards; Ratio analysis classification and limitations.

Unit IV: Standard costing and analysis of variances: Meaning and nature of standard cost; Advantages and applications ; Steps in standard costing ;Variance analysis-material, Labour, Overhead and sales variances

Unit V : Marginal Costing: Concept meaning and nature of marginal cost; Marginal cost as a tool of decisions making ; Marginal costing Vs absorption costing; Break-even analysis; Exploring new markets; Make or buy decisions and shut down decisions.

Chaudhary Charan Singh University
Merrut

Syllabus Of B.Sc Agriculture

B.Sc. Ag., SEMESTER-I

Sl. No.	Department	Credit Hours	Title of the course
1.	English Department	1+1=2	Structural & Spoken English
2	Agronomy	2+1=3	Principles of crop Prodcution Principles of Agronomy (ICAR)
3	Ag. Chemistry	2+1=3	Fundamentals of Soil Science
4	Ag. Botany	1+1=2	Elements of Genetics
5	Statistics	1+1=2	Elementary Statics and applied mathematics elements of Statistics (ICAR)
6	Soil Conservation	1+1=2	Agricultural Meterology
7	Agriculture Extension	1+1=2	Rural Sociology and Educational Psychology
8	Horticulture	2+1=3	Fundamentals of Horticulture
9.	Physical Department	0+1=1	Physical Education (Only Practical No. Syllabus by ICAR)

Course- I

Semester- I **1+1=2**

STRUCTURAL & SPOKEN ENGLISH

(A) ELEMENTS OF ENGLISH GRAMMER : A REVISION

1. Study and use of Articles: Pronouns and Prepositions.
2. Tenses in English

(B) SENTENCE STRUCTURE

1. Sentence formation
2. Some common varieties of sentence structure (including errors).

(C) READING COMPREHENSION

Six specified lessons from the following text book:

Name : Glimpses of English Prose.

Author : Dr. O.P. Dixit

Publisher : Sahitya Niketan, Kanpur

(D) WRITTEN COMMUNICATION

1. Letter and application writing
2. Report writing.

(E) VOCABULARY

1. Synonyms and antonyms
2. One word substitution
3. Affixes, prefixes and suffixes

PRACTICALS

1. Speech mechanism-speech event, production of speech, speech organs.
2. Phonetic sounds and symbols-pure vowels, diphthongs and constants (voiceless/voiced, accented/u naccented, aspirated/u naspirated).
3. Stress and intonation-word-accent (syllable, consonant clusters), stressshift, compound words, word accent in Indian English v/s R.P., rules for accentual patterns.
4. Accent in connected speech-rhythm, weak forms, intonation etc.
5. Listening comprehension
6. Reading comprehension.

Course- II

Semester-I **2+1=3**

PRINCIPLES OF CROP PRODUCTION

PRINCIPLES OF AGRONOMY (ICAR)

1. Definition and scope of Agronomy.
2. Classification of Crops of Different basis.
3. General principles of Crop production : Climate, soil, preparation, seed and sowing, post sowing-tillage, water management, nutrition, plant protection measures, harvesting, threshing and storage.
4. Crop sequences and system with emphasis on mixed cropping and inter cropping.
5. Nutritional management of crops including application of meanures, fertilisers and bio-fertilisers. Concept of integrated nutrient supply system.

Practical

1. Study of weather and weather forecasting.
2. Identification of crops, manures and fertilisers.
3. Framing of crop rotations and preparation of cropping schemes for varying agro-climatic conditions.
4. Preparation of seed bed based on important inter-cropping systems.
5. Calculation of fertiliser requirement, fertiliser mixtures and unit values.
6. Methods of fertiliser application.

Course- III

semester- I **2+1=3**

FUNDAMENTALS OF SOIL SCIENCE

1. Definition of Soil, Components of Soil and their role in agriculture.
2. Soil forming rocks and minerals, Development, of Soil profile, Soil formation, factors affecting soil formation, soil forming processes.
3. Soil reaction and its measurements and significance.
4. Chemistry of clay minerals with special reference to Kaoinite, Montmorrillonite and little.
5. Physical properties of soil, and their significance.
6. Chemical properties of soil, cation and anion exchange phenomenon and their importance in agriculture.
7. Soil organic matter, humus formation and its importance in soil fertility, management and maintenance of organic matter in soils.
8. Soil of U.P. classification, distribution, characteristics.
9. Elementary idea of soils of India-occurrence, characteristics, physicochemical properties of chernozems, pobzol and laterite soil.
10. Basic idea of comprehensive system (7th approximation) of soil classification.
11. Elementary idea of soil survey and Land capability classification.
12. Occurrence, distribution and functions of Soil Micro-organism. Biological Nitrogen Fixation (Symbiotic and Non symbiotics), Nitrification, Microbial decomposition of orgame Matter in soil,
13. Role and use of Biofertilizers.in Crop Production,
14. Role and use of Biofertilizers in Crop Production,
15. Classification and use of Insecticide, Fungicides and herbicides eg. BNC, DDT, Malthion, 2,4,D.

Practical:

1. Preparation of HCL extract of Soil
2. Determination of FeO, R203, Ca and P in HCL extract

3. Determination of soil O.M.
4. Estimation of Cl, C03, HCO3 in soil extract
5. Determination of total nitrogen in soil.

Course- IV

Semester- I **1+1=2**

ELEMENTS OF GENETICS

1. Definition, significance and historical development in genetics.
2. Mendel's Law's of heredity.
3. Chromosomal theory of inheritance, melosis and mitosis.
4. Linkage and crossing over-types, mechanism and significance,
5. Nucleic acid as genetic material-structure, replication, genetic code and translation.
6. Mutation-spontaneous and induced.
7. Chromosomal changes-molecular structure and numerical.
8. Multiple factor inheritance and multiple alleles, blood groups in man and body coat colour in rabits.
9. Sex chromosomes and its determination in man and droisophila, sex linked characters.
10. Cytoplasmic inheritance-plasma and nuclear, gene inter-action.

Practical

1. Preparation of temporary cytological slides (mitosis and meiosis)
2. Genetical problems on monoand dihybrid ratios with their modifications.
3. Chi-square test and goodness of fit of Mendelian modified ratios.
4. Practical record
5. Viva-voce

Course- V

Semester- I **1+1=2**

ELEMENTARY STATISTICS AND APPLIED MATHEMATICS

ELEMENTS OF STATISTICS (ICAR)

STATISTICS

Definition, Aims, Characteristics and Limitations of statistics, Classification and Tabulation of data.

Definition, advantages and disadvantages of Arithmetic Mean, Median, Mode; Geometric Mean, Harmonic Mean and Weighted Mean as measures of central tendency; and Range, Quartile Deviation, Mean Deviation, Variance, Standard Deviation and Coefficient of variation as measures of dispersion.

Definition of probability, Additive and Multiplicative Laws of probability and simple problems based on them. Definition, merits and demerits of sampling and Random Sampling. Concept of Standard Error. Basic concepts used in tests of Significance like Null Hypothesis, Degrees of freedom and Level of significance. Definition and uses of z and t-tests in testing significance of difference between two means; F-test in testing equality of two variances and (x2= test as a test of independence of attributes in 2x2 contingency table only.

Bais principles of Experimental Design. Description and Analysis of Completely Randomised Design (C.R.D.), Randomised Block Design (R.B.D.) and Latin Square Design (L.S.D.)

MATHEMATICS

Binomial Theorem for positive integral index only. Uses of Natural and common Logarithems. Exponetial Series. Limits and Differentiation (Without differentiation by first principles). Differentiation of algebraic, trigonometrical, logarithmic and exponential functions only, Logarithmic differentiation. Differentiation of products, quotients, function of functions, implicit and explicit functions.

Practical

Based on

1. Measures of Central Tendency
2. Measures of Dispersion
3. Tests of Significance
4. Analysis of CRD, RBD and LSD

Course-VI

Semester- I **1+1=2**

AGRICULTURAL METEROLOGY

Different meteorological variables related to agriculture.

Rainfall- Hydrologic cycle and it's components. Types and forms of precipitation. Storms, occurrence, variation and measurement of rainfall. Rain guages, Computation and analyses of data. Plotting of mass curve and rainfall, intensity curve.

Run-off- Definition, types, factors affecting, estimation and measurement of run-off.

Atmosphere - Definition and structure, climatre and weather, atmospheric pressure, factors affecting, measurement.

Elementary idea of insolation, Temperature, kinds and measuring instruments, evaporation, factors affecting, measurement

Humidity, definition, windvane, Anemo-meter.

Indian Agro Climatic Zones

Elementry idea of weather forecasting.

Practical

1. Computation of average rainfall.
2. Mass Curve
3. Plotting Bargraph for rainfall data.
4. Rainfall intensity curve.
5. Measurement of rainfall by Raingauge.
6. Measurement of Atmospheric Pressure.
7. Plotting line graphs for illustrating climatic factor such as temperature.
8. Measurement of Relative Humidity.
9. Study of wind vane and Anemometer.
10. Measurement of Evaporation by USDA evaporation pan.

Course-V

Semester- I **1+1=2**

RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY

1. Definition and scope of rural sociology.
2. Basic concept of society, community and groups
3. Characteristics and Differences of rural and Urban communities
4. Basic rural institutions and their role in Agriculture development.
5. Definition and types of rural leadership and their role.
6. Definition, nature and importance of psychology in the development of human behaviour.
7. Meaning of habit and habit development.
8. Basic Psychological concepts; motivation, Social Interaction, Attitudes, Emotions, Prejudices and Social Perception.
9. Personality- definition and development.

Practical

1. Socio-economic survey of village communities.
2. Developing schedules and questionnaires.
3. Practical knowledge about the working of basic rural institutions.
4. Identification of important value systems in the rural setting as a means of social control.
5. Identification of rural personality traits that affect the development of personality in rural situation.

Course-VIII

Semester- I **2+1=3**

FUNDAMENTALS OF HORTICULTURE

Introductory knowledge of main branches of horticulture and their importance; Botanical classification of fruits; climatic fruit zones of Uttar Pradesh and fruits grown therein; Establishment of orchards; Selection of site, systems of planting; Orchard soil management; Systems of irrigation; Principles of pruning and systems of training of fruit plants; Unfruiffulness, its causes and measures to overcome it; fruit drop, its causes and measures to control it; rejuvenation of orchards, Brief studies of polyembryony, parthenocarpy and incompatibility.

Practical

1. Identification of garden tools and plants;
2. Preparation of orchard layouts for different climatic zone of U.P.;
3. Practice of propagation of major fruit plants;
4. Preparation and seed beds and raising of seedlings;
5. Practice of lifting and packing of nursery plants;
6. Visit to nurseries, gardens and research stations.

B.Sc. Ag., SEMESTER-II

Sl. No.	Department	Credit Hours	Title of the course
1.	Agriculture Engineering	1+1=2	Cereals Millets, and pulses crops (field crops Kharif Crops)
2	Agriculture Extension	2+1=3	Principal of plant breeding
3	Agriculture Botany	2+1=3	Form power and Machinery, farm Structures, Power and Machinery (ICAR)
4	Agriculture Entomology	1+1=2	Environmental Science Agro Ecology
5	Plant pathology	1+1=2	Agriculture marketing, export and cooperation
6	Agriculture soil	3+1=4	Vegetable Production
7	Agriculture Soil Chemistry	3+1=4	Elementary Microbiology and Soil microbiology

Course- I

Semester- II **1+1=2**

IRRIGATION AND WATER MANAGEMENT

1. Importance of water in crop production.
2. Soil Moisture constants.
3. Water requirement of crops and factors affecting it.
4. Approaches of irrigation scheduling.
5. Systems and methods of irrigation
6. Quantity and quality of irrigation.
7. Measurement of irrigation water.
8. Elementary idea of drainage on farms.

Practical

1. Measurement of irrigation water.
2. Determination of soil moisture content and quality of water.
3. Calculation on consumptive use of water.
4. Numerical exercises on drainage and irrigation requirement.
5. Calculation of irrigation water use efficiency
6. Visit to irrigation and drainage projects.

Course- II

Semester- II **2+1=3**

FUNDAMENTALS OF EXTENSION EDUCATION AND RURAL DEVELOPMENT

1. Extension Education:

(a) Meaning, definition, objectives, Principles, Scope, Philosophy and its distinguishing features.

(b) Extension Teaching and Learning : Teaching, Teaching Elements, steps in Teaching, Learning, Learning Situation, Basic Principles of Teaching and Learning.

(c) Early Extension Efforts in India.

(d) Comparative study of Extension Service in India and USA.

2. Community Development:

(a) Meaning, Definition and objectives of community development.

(b) Organisational set up and Activities of Community devIopment at State, District, Block and Village level.

(c) Extension and Rural Development Programmes : Including T & V system, National Demonstration, IRDP, Jawahar Rojgar Yozana.

3. Extension Programme Planning, Monitoring and Evaluation:

(a) Meaning, Principles and Procedure of Programme Planning.

(b) Definition : purpose, types, criteria and steps involved in monitoring and evaluation.

Practical

1. Practice in Conducting Survey
2. Practice in preparing schedule and Questionnaire for studying the organisational set up of community development.
3. Contact with the farmers and educating them in new technology of Agriculture.
4. Development programme for a village & a Block.
5. Preparation of an outline and practice on evaluation of a programme.
6. Classification, Tabulation and diagrammatic representation of data.
7. Writing study Reports.

Course- Ill

Semester- II **2+1=3**

ELEMENTARY CROP-PHYSIOLOGY

1. Role of plant physiology in agriculture.
2. Cell structure and function.
3. Physico-chemical phenomenon-diffusion, osmosis and imbibitions.
4. Essential nutrient elements, their role, deficiency sysptoms, mineral salt, absorption.
5. Photosynthesis - light and dark reactions.
6. Mechanism of respiration, transpiration
7. Fat metabolism, synthesis of fatty acids, glycerole and their condensation.
8. Assimilation of nitrogen in plants.
9. Plant growth substances, photoperiodism and vernalization.

Practical

1. Experiments on diffusion, osmosis and imbibition.
2. Determination of transpiration rate by potometers.
3. Extraction of photosynthetic pigments, separation of chlorophyll "a" and "b" and carotenoides.
4. Experiments on factors affecting rate of photosynthesis (CC, light and temperature).
5. Determination of photosynthetic and respiration rates through portable CO2 gas analyser.

Course- IV

Semester- II **1+1=2**

INTRODUCTORY ENTOMOLOGY

1. General introduction to Phylum-Arthropoda, its various classes and their distriguishing characters with particular reference to class lnsecta
2. Insect Morphology: Body wall-structure, composition and functions; Body divisions-Head (Structure and its appendages; structure, functions and modifications of antinae; Mouthparts-Biting and chewing, piercing and sucking, sponging, siphoning, chewing, and lapping); Thorax-its structure and appendages, modifications and functions of legs and wings, wing coupling apparatus and wing venation; Abdomen-its segements and appendages.
3. Anatomy: Digestive, Excretory, Reproductive, circulatory, respiratory and nervous systems of grass hopper.
4. Sense organs : Structure and functions of ocelli, compound eye and johonston's organ.
5. Post-embryonic development including ecdysis, instars, types of larvae and pupae. Different types of metamorphosis.
6. Taxonomy: Insect Classification upto the level of families of agricultural importance of following orders:

Orthoptera : Acrididae;

lsoptera : Termitidae;

Hemiptera : Coreidae, Pyrrhocoreidae, Lophopidae, Aleurodidae, Jassidae, aphidae, Coccidae, Lacciferidae,

Coleoptera : Dermestidae, Coccinellidae, Bruchidae Chrisomelidae; Curculionidae, Tenebrionidae, Scarabaeidae;

Lepidoptera : Gelechiidae, Pyralididae, Noctuidae, Cymbidae, Papilionidae, arctiidae and Bombycidae;

Hymenoptera : Tenthredinidae and Apidae

Diptera : Trypetidae

Practical

1. Dissection of Grasshopper for the study of digestive, reproductive and nervous system.
2. Study and Temporary mounting of external parts of grasshopper.
3. Identification and comments upon the various Arthropods with special reference to class Insecta.
4. Collection and preservation of insects.
5. Viva-voce and practical records.

Course- V

Semester- II **1+1=2**

INTRODUCTORY PLANT PATHOLOGY

1. Definition and importance of plant pathology.
2. Causes of plant diseases.
3. Classification of plant diseases according to cause and occurrence.
4. Plant Pathogens:

(a) Fungis

(i) Economic importance and general characteristics.

(ii) Morphology of different vegetative structures (thallus, mycelium, haustoria, etc.)

(iii) Reorduction

(iv) Different types of spores.

(v) Levels of parasitism

(vi) Nomenclature

(vii) Classification of fungi with special reference to genera listed under item (viii) Life histories of Pythium, albugo. Erysiphe, Ustilago Clareicaps and Puccinia.]

(ix) Diagnositic characters of the following genera, Phytophthora, Peronospora, Sclerospora, Ustilago, Sphacelotheca, Tolyposporium, Melampsora, alternaria, Cerospora, Fusarium, Helminthosporium Pyricularia, Rhizoctonia, Colletrotrichum.

(b) Bacteria:

(i) Brief history of bacteria as plant pathogens.

(ii) Morphology and Cell structure.

(iii) Vegetative reproduction.

(iv) Brief outline of classification of plant pathogenic bacteria.

(v) A brief account of mycoplasma.

(c) Viruses

(i) Nature and properties.

(ii) Transmission of plant virus

(d) Phanerogamic parasites: Cucuta, Loranthuus, Orobanche and striga.

Practical

1. Temporary slide preparation of representative genera of disease causing fungi for morphological studies
2. Simple staining of bacteria from milk and curd
3. Preparation of PDA
4. Practical record
5. Viva voce

Course- VI

Semester- II **3+1=4**

ELEMENTARY PLANT BIOCHEMISTRY AND CHEMISTRY OF PLANT PRODUCTS

1. Scope of biochemistry.
2. Carbohydrates - Definition, Classification, Chemistry and Structural formula of the following

(a) Monosaccharides - D Glucose, D. fructose, D. Galactose

(b) Oligosaccharides - Sucrose, Maltose, Lactose.

(c) Polysaccharides - Starch, Cellulose, Inulin.

3. Proteins - definition, classification, composition, important functions Primary and secondary Structure of protein, Biological significance of proteins.
4. Amino acids - Classification, properties of Amino acids structure of the following amino acids- Glycine, Tryptophane, Aspartic acid, serine, lysine, Histidine, Methionine, protein; Essential and non-essential amino acids, Nutritional significance of amino acids.
5. Lipids- Definition, classification, properties and structural formula of the following saturated fatty acids (Butyric acid, caproic acid, palmitic acid, stearic acid) and unsaturated fatty acid (oleic acid, Liniolenic acid, erucic acid).
6. Enzyme - Occurrence, nomenclature, classification, mechanism of action, general properties and factors effecting the rate of enzyme action, coenzyme-A.
7. Vitamins - Classification, biochemical functions and structural formula of vit. A, thiamine, raboflavin, Vit. B12 Ascorbic acid, vit. D.
8. Phytohormones - Occurrence, structure and functions of important plant growth substances viz. Auxins, gibberellins, cytokimuis and Abscisic acid.

9. Alkaloids - Occurrence, classification, uses general properties and Biological significance of alkaloids. Structural formula of Conine Nicotine and Papaverine.
10. Nucleic acid - structural formula of Pyrimidines and Purines, Nucleosides and N<ucleotides Watson and crick model of DNA.

Practical

1. Qualitative test of important sugars, proteins and alkaloids.
2. Estimation of starch in plants.
3. Estimation of reducing and non reducing sugars in cane juice and jaggery.
4. Separation and identification of amino acid by paper chromatography.
5. Iodometric titration.
6. Estimation of Diastase enzyme in plants.
7. Estimation of Ca by EDTA method.

Course- VII

Semester- II **3+1=4**

INTRODUCTION TO AGRICULTURAL AND NATURAL RESOURCE ECONOMICS AND FARM MANAGEMENT ECONOMICS

A. Natural Resource Economics

1. Definition, subject matter and scope of economics.
2. Micro Economics and Macro Economics within both static and dynamic framework.
3. Definition, subject matter and significance of agricultural economics.
4. Primitive and scientific Agriculture. Characteristics and Indian agriculture; major problems including causes of low productivity.
5. Economic Development, role of agriculture Technological change in agriculture and various inter-relationships.
6. Task of an economic system, role of economic theory in agriculture.

Production:

Basic production problems production function, productivity curves; relationships thereof, intensity of resource use, law of diminishing returns, output- elasticity, homogeneity in production functions.

Consumption:

Theory of demand, demand curves, consumption function, Elasticity, Utility Analysis, Indifference Curve, Consumer's surplus.

B. Natural Resources

Meaning, Geographical situations, Topography and crops (Agro zones), Temperature and plant growth, Land and land use, culturable waste land crop rotations, cropping scheme and cropping intensity. Forest- Classification, causes of deforestration. Functions of forests. Forestry programmes of the Indian Government Water Irrigation sources, progress, Misuse of irrigation water. Application of economic laws to irrigation, growth and utilization of irrigation potential, Command Area-meaning and Functions of water Managements. Management of irrigation water. Ongoing projects including watershed management programme. Utilized groundwater resources.

C. Farm Management Economics

1. Definition and scope of farm economics and management
2. Farm Management and production economics. Agricultural Economics and industrial Economics-Similarities and differences.
3. Management decisions and cultivators' holdings. Economic Principles their role in farm management. Application of economic Principles/Laws.
4. Law of Diminishing, Returns/Principle of variable Proportions laws of return, scale properties, Law of Equi-mangiral Returns, Law of such situation, opportunity cost/opportunity Returns, Law of comparative advantage.

5. Production Function, productivity curves, least cost combination of inputs, Principle of conbining Enterprises Determination of Optumum output.
6. Cost concepts and Principles, Cost Relationship and curves.
7. Time Comparison (Compounding and discounting of costs). Allocation of Over-head and command costs.
8. Profit Maximization.
9. Measures of form profit.
10. Farm Records and Accounts.
11. Methods of valuation and depreciation of assets.
12. Types of farming : Diversified, General farm, subsistence or Marginal farming, specialized farms, Mixed farming, Ranching and Dry farming.
13. Systems of farming Cooperative farming, peasant farming, state farming, collective farming, capitalistic farming.
14. Tools of Farm Management : Farm Budgeting (Complete and partial budgeting) and farm planning, Linear Programming (Graphical method).
15. Definition of Institute and University Types of uncertainty in agriculture (Price uncertainty, yield uncertainty, innovation uncertainty Social and legal frame as a source of uncertainty). Diversification (complementary and supplementary relationships) as a mechanism to minimize uncertainty), crop and cattle insurance, pumpset insurance Arguments for and against.

Practical:

1. Socio-economic survey and collection of data, classification and tabulation with special reference to natural resources of a village.
2. Study of a farm holding (resources, enterprises, costs, profit and complete farm economy) of the allotted farmer by cost-accounting method.
3. Preparation of an alternative farm plan for the farmer.
4. Submission of Report.

B.Sc. Ag., SEMESTER-III

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Cereals Millets, and pulses crops (field crops Kharif Crops)
2	Agriculture Botany	2+1=3	Principal of plant breeding
3	Agriculture Engineering	2+1=3	Form power and Machinery, farm Structures, Power and Machinery (ICAR)
4	Soil Conservation	2+1=3	Environmental Science Agro Ecology
5	Agriculture Economics	2+1=3	Agriculture marketing, export and cooperation
6	Horticulture	2+1=3	Vegetable Production
7	Agriculture Soil Chemistry	2+1=3	Elementary Microbiology and Soil microbiology
8	Agronomy	0+1=1	Practical crop production

Course- V

Semester- III **2+1=3**

CEREALS MILLETS, AND PULSES CROPS

(Field Crops Kharif Crops)

Importance, origin, distribution climate varieties soil practices, manuring and irrigation, plant protection, harvesting and processing of the following crops, under different agroclimatic conditions of U.P.

A.	Cereal Crops	:	Paddy, Maize
B.	Millet Crops	:	Sorglum,
C.	Oil seed	:	Groundnut, Til, caster
D.	Pulses Crops	:	Pigeon Pea, Urobean, Moongbean, Soyboan, Cowpeft.
E.	Fibre Crops	:	Cotton, Jute, Suhhemp, Mesta
F.	Green Manure crops	:	Sun hemp and Dhencha
G.	Fodder Crops	:	Sorghum, Pearhmillet, Maize, Napier, Sudan grass, cluster, bean, cowpen
H.	Cash crops	:	Sugarcane, Tobaceo

Practical

1. Identification of crop-seeds, plants associated weeds.
2. Practical knowledge of operations from sowing to harvesting of kharif crops included in theory course.
3. Judging of maturity and estimation of yields.
4. Study of crop production techniques at different farms.
5. Calculation of seed and fertilizer requirement of crops.
6. Preparation of seed beds of important crops.
7. Visit to farms of University and Institutes.

Course- II

Semester- III **2+1=3**

PRINCIPLES OF PLANT BREEDING

1. Plant Breeding-history, objectives and scope.
2. Mode of reproduction in crop plants in relation to breeding techniques.
3. Plant variation kind and causes.
4. Genetic consequences of self and cross pollinated crops.
5. Plant Introduction and exploration.
6. Breeding cross pollinated cropspureline, mass selection, pedigree, bulk and back cross methods.
7. Male sterility and its importance.
8. Breeding of asexually propagated crops, Clonal selection and apomixsis.
9. Polyploidy and mutation breeding.

Practical

1. Technique of emasculation and artificial pollination in important crops.
2. Skeleton of different breeding procedures.
3. Practical record.
4. Viva-voce.

Course- VI

Semester- III **2+1=3**

FARM POWER AND MACHINERY

FARM STRUCTURES, POWER AND MACHINERY (ICAR)

1. Farm structures farm site, food storage structure Breeding materials farm house, dairy building poultry housing.
2. Elementary knowledge about the engineering terminology and calculations on piston displacement compression ratio, hip and Licenses of engines construction and working of four stroke and two stroke cyclic engines common engine tables causes and their remodes.
3. classification of tractors elementary knowledge about following main components of tractor and their functions steering clutches, transmission different and final drive brakes, bolt, pulley PTO, shift and hydraulic lift methods of starting and stopping of tractors. General care and maintenance.
4. Study of simple parts operation and installation of anelectric meter (Induction type, eniyl, calculation of HP units consumed Role of switches fuses and strater,
5. Study of construction working principles toubles and adjustments of the following machines.

Discplough dischonow seed drill planter reaper mower threshers combine spresyes and dusters calculation of area covered power requirement and efficiency of above machines.

Practical:

1. Preparation of layout for farm houses dairy barn and poultry housing.
2. Study of construction of four stroke and two stroke cycle engines operating and running of diesel engines.
3. Study of tractors systems tractor driving practice.

4. Study of disc plough, study of seed drill plants and its calibration, study of throsher and combine.
5. Visits to places of engineering interest.
6. Identification of different work shop tools and machines and their used.

Course- IV

Semester- Ill **2+1=3**

ENVIRONMENTAL SCIENCE AGRO ECOLOGY

1. Ecology - definition, division and significance.
2. The Environment - environmental management and control of pollution, affecting plant growth a biotic and blanic isotere interaction.
3. Ecosstom major ecosystems, energy and its flow in ecosystem biochemical cycles and nutrient cycles.
4. Plant community - classification composition, and study of plant community structure.
5. Plant adoption - ecological classification of plants and their morphological anatomical and pysiological adaptations to adverse environments hyd rophytes, xerophytes, mesophytes, apiphytes and holophyos
6. Ecological problems of major crops-cereals, millets, pulse and oilseeds Practical

1. To record temperature, relative humidity and light intensity value of the atmosphere.
2. To study the community by quadrat method by determining plant structure different specie crops.
3. To study the getution of the givne area by a phyoloycoinic method biological spectrum method.
4. To determine the biomass producers in the given area.
5. To record abiotic components- pH, temperature, light intensity, turbidity is pond ecosystem.

Course- VII

Semester- III **2+1=3**

AGRICULTURE MARKETING, EXPORT AND COOPERATION

A. Agricultural Marketing:

1. Market, Meaning, scope and classification of markets. Definition of agricultural marketing, demand, supply and price.
2. Marketable surplus, marketed surplus. Integrated marketing.
3. General theory of markets and marketing.
4. Demand for agricultural products.
5. Production and market supply.
6. Price Determination and price analysis under different market structures.
7. Marketing Functions and services.
8. Marketing costs margins and efficiency.
9. Defects of Present system of marketing of agricultural produce. Steps taken by the Indian Government and possibilities of improvements.
10. Fixation of agricultural Prices.
11. Marketing Institutions: Regulated and cooperative markets.
12. Market Research.

B. Export.

1. The concept of export as a district business activity in agricultural sector of the Indian economy, its importance and role in economic development.
2. Policies of export of food grains and agricultural commodities pursued by the ndian Government.
3. mport vs. export value of cereals and other agricultural commodities.
4. gencies engaged in exporting agricultural goods.

C. Cooperation

1. Maning and Concept of Cooperation, principles of Cooperation (Equality,niversality, distributive, justice, democracy, unity, honorary

services voluntaryism). Place of thrift in cooperation, economic planning and cooperation.

2. History and Progress of cooperative movement in India.
3. Structure and organisation of agricultural cooperation in India.
4. National cooperative federations, courses of slow growth of agricultural cooperatives, suggestions for rapid development. National Bank for Agriculture and Rural development (1982).
5. Cooperative farming : Meaning thereof, New classification cooperative farming, cooperative joint farming, cooperative collective farming. Advantages thereof. Reasons for apathy of farmers in adopting cooperative joint farming.

Practical

1. Survey of a market (mandi) both primary and secondary (atleast one each).
2. Case studies of marketing of a minor and a major commodity w.r.t. marketing channels costs margin and price spread over.
3. Study of a (i) cooperative marketing society (ii) a warehouse functioning market (iii) a regulated market and (iv) a cold storages.
4. Submission of a report on the above four aspects.

Course- VI

Semester- III **0+1=1**

VEGETABLE PRODUCTION

Importance and scope of vegetable production in India; Classification of vegetables. Types of vegetable gardens; Culture and seed production of major vegetable like Potato, Brinjal, chillies, tomato, Cauliflower, Cabbage, Onion, Bottle, gourd, Musk melon, watermelon, Okra, Radish, Carrot and Pea.

Practical

1. Nursery raising of vegetable crops.
2. Production of seeds in vegetable available at the time of course.
3. Cost of cultivation studies in Potato, Tomato, Cauliflower and Okra.
4. Production oriented training in cultivation of vegetable crops.

Course- VII

Semester- III **0+1=1**

ELEMENTARY MICROBIOLOGY AND SOIL MICROBIOLOGY

1. Definition, scope and importance of microbiology.
2. A brief survey of microbiology:
   (i) Prokaryotes and Eukaryotes.
   (ii) Types of microorganisms : algae, protozoa, fungi, bacteria and viruses.
   (iii) Size relationships.
3. Simple staining and gram staining techniques of bacteria.
4. Characteristics of gram positive and gram negative bacteria.
5. Classification of bacteria (only important groups)
6. An elementary idea of general characteristics, classification and reproduction of fungi, algae and protozoa.
7. Biogeochemical cycles: Nitrogen, Carbon, Sulphur and Phosporous cycles.
8. General structure of bacteriophage and replication.
9. Sterilization and disinfection.

Practical

1. Study of different parts of light compound microscope and their functions.
2. Gram staining of bacteria.
3. Preparation of nutrient broth, Czapek's and Richard's media.
4. Identification of algae, fungi and protozoa.
5. Practical record
6. Viva voce.

Course- VIII

Semester- III **0+1=1**

PRACTICAL CROP PRODUCTION

In this course, team of about 10 students will be given a sizable plot of land (100 sq.m. minimum) for a full year. The team will manager crop production enterprise from a to z including maintenance of account and preparation of balance sheet. No paid labours will be supplied and other inputs will be supplied on loan and their cost will be deducted from the receipt of the enterprise. The net profit will be distributed among the students. To cope with natural calemilies a revolving fund will be raised by deducting 10% amount from net profit every year. The evaluation of students will be done on the basis of actual working units, share in profit, oral examination and maintenance of accounts and records.

B.Sc. Ag., SEMESTER-IV

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Oil seeds commercials crops fields crops-II Rabi crops (ICAR)
2	Agriculture Botany	2+1=3	Breeding of field crops
3	Soil Conservation	2+1=3	Principles of soil physics and conservation soil survey/land planning and remote sensing (ICAR)
4	Animal Husbandry	2+1=3	Livestock production and management (including poultry) lives stock production India poultry swine and goa farming along with animal diseases (ICAR)
5	Entomology	2+1=3	Economic Entomology, Economic entomology including crops (ICAR)
6	Horticulture	2+1=3	Fruit production fruit production including plantation crops (ICAR)

Course- I

Semester- IV **2+1=3**

OIL SEEDS COMMERCIALS CROPS

Field Crops II

RABI CROPS (ICAR)

Importance, origin, distribution, climate, varieties improved, agronomic practices managing and irrigation, plant protection, harvesting and processing of the following crops under various agroclimatic conditions of U.P.

A.	Cereal Crops	:	Wheat, Barley, Oat
B.	Oilseed Crops	:	Rapeseed and mustard Linseed, Sunflower
C.	Pulse crops	:	Chickpea, fieldea Lantil, Rajmash
D.	Fodder Crops	:	Oat, Berseem Lucene
E.	Cash Crops	:	Potato Mentha

Practical

Studies the practical course for the field crops I with suitable allegation of crops included in the syllabus.

Course- I

Semester- IV **2+1=3**

BREEDING OF FIELD CROPS

1. Origin, distribution and objectives.
2. Breeding problems, systematic description and economic importance.
3. Breeding methods adopted and achievements with reference to following crops:

(a)	Cereals	:	Wheat, rice and maize
(b)	Millets	:	Sorghum and pennisetum
(c)	Pulses	:	Gram, Pea and arhar
(d)	Oil-seeds	:	Mustard, groundnut and sunflower
(e)	Others	:	cotton and potato

Practical

1. Identification of important varieties of above mentioned cvorps.
2. Systematic description and artificial hybridiation and above mentioned crops.
3. Significant research advances made in above mentioned corps.
4. Practical record
5. Viva-voce.

Course- I

Semester- IV **2+1=3**

PRINCIPLES OF SOIL PHYSICS AND CONSERVATION

SOIL SURVEY/LAND PLANNING AND REMOTE SENSING (ICAR)

Physical properties of soil and their determination.

Definition and importance of soil conservation in agriculture. History and soil conservation in India.

Soil survey, definition Land use capability classification different types of soil in India.

Soil erosion, definition types, mechanics and causes of eerosion. Factors affecting soil erosion. Agronomical practices for soil and water conservation. Engineering practices for erosion control such as bunding, terracing, temporary and permanent structure for Gully control. Grassed water ways. Water harvesting.

Wind erosion mechanics, control, sand dune fixation, shifting cultivation.

Survey, measurement of distance direction and elevation.

Role of grosses and forests in soil conservation, farm forestry, social forestry.

Practical

1. Fomiliarization with chain survey equipments.
2. Exercises on chain survey.
3. Familiarization with prismatic compass (P.C.)
4. Open traversing by chain and P.C.,
5. Closed traversing by Chain and P.C.
6. Calculation of included angles.
7. Study and adjustment of Dump level (D.L.)
8. Differential leveling by D.L.
9. Profile leveling by D.L.
10. Calculation of Reduced level.
11. Construction and design of bunds with calculation of earth work.]

12. Calculation of infiltration rate and bulk density.
13. Visit to soil conservation research centre for erosion and control.

Course- IV

Semester- IV **2+1=3**

LIVESTOCK PRODUCTION AND MANAGEMENT (INCLUDING POULTRY)

LIVES STOCK PRODUCTION INDIA POULTRY SWINE AND COAT FARMING ALONGWITH ANIMAL DISEASE (ICAR)

General:

Importance of livestock in Agriculture Relationship of plants with animal husbandry. Dairying under specialized and mixed farming. Livestock and milk Production statistics, milk distribution.

Dairy cattle & Buffalows management:

Breeds, Breeding methods and systems, care and management of milich cows at after calving; Raising of calves, management of heifers and bulls maintenance of livestock records milking methods and principles. Clean milk production. Pasture management. Housing for dairy animals.

Pig Management

Importance, important Breeds, raising piglets upto age of slaughter. General aspects of breeding, care of sow and boqr.

Seep/goat management:

Importance, important breeds, raising to kids/lambs, breeding, feeding of goats/sheep

Poultry production:

Importance, important breeds, General aspects management of raising broilers and layers, feeding of different class of birds, Grading of eggs and preservation.

Diseases:

Signs of illness, control measures of disease, classification of diseases. Modes of transmission, prevention and treatment of disease of bovine (HS, RP, BO, Anthrax, Brucelloses, Johne's. Mastitis, Milk fever, FMD), Sheep and goats (enterotoxaemia, coccidiiosis, ascariasis), pigs (Swine fever, Hog

chotern) and poultry (Ranikhet, fowl pox, CRD, Marex, Gumbaro). Vaccination programme for cattle and poultry.

Practical

Study of external body parts, study of phenotypic and physiological different between cow and buffaloes, zebu, vs. Taurus, estimation of body weight measurements, marking for identification castration, dehorning. Estimation of judging cost of milk production problems on soil capacity, computation of mediation ration mixing of feeds, casting and throwing, Grooming, Preparing scheme of round the year defermining temperature pulse and animals.

Course- III

Semester- IV **2+1=3**

ECONOMIC ENTOMOLOGY

ECONOMIC ENTOMOLOGY INCLUDING FISHERY (ICAR)

1. Economic importance of insects, nature and extent of damage, life history and management of the major insect pests of following crops as mentioned against them:

Paddy	Leptocorisa variconis, Hieroglyphus Spp., Nilaparvata lugens, Nephotetix, spp., Mythimna separate.
Jower Maize	Chilo partellus, Atherigona varascoccate.
Sugarcane	Tryporyza novella, Emmalocera depressella, Pyrilla prepussila, Aleurolobus barodensis.
Cotton	Pectinophora gossypiella, Earias Spp., Sylepta derogala, Dysdercus Spp., Bomisia tabci, Amrasca blouttula.
Oilseeds	Lipaphis erysimi, Athalia proxima Bagrada Cruciferarun Dasyneura lini.
Pulses	Helicoverpa armigera Agrotis Spp., Etiella Zinckenella, Melanagromyza obtuse, Phytomyze atriornis.
Pests of Fruit crops	Drosicha Mangiferae idioscopus Spp., Papilio Demeclius, Diaphorina citri Phyllocnistis citrelia, Otheris Spp. Virechois isocrates. Eriosoma lanigerum. Quadraspidiotus permincousus.
Pest of Vegetable Crops	Leucinodes orbonalis, Epitachna viontioclopunctate. Raphidoplapa foveicollis, Dacus Cucurbitae, Plutella Xylostella.
Pests of Stored Grains	Sitophilus oryzae, Trogoderma granarium, Tribullum castaneum, sitotroga cerealella, callsobruchus

	chinensis
Polyphagus pests	Odontotermes abesus, Schistocerca gregaria, Holotirichia consanquincea spilosoma oblique, spodoptera litura, Amsecta Spp.

2. Elementary knowledge of agriculture and lac culture.

Practical

1. Collection, mounting and preservation of insect pests of crops stages.
2. Filed and laboratory acquaintance withinsect pests, the various srages and damaged materials.
3. Technical knowledge of honey, silk and lac prodsuction.
4. Filed application of insecticidal formulations.
5. Practical records and Viva-voce.

Course- VII

Semester- IV **2+1=3**

FRUIT PRODUCTION FRUIT PRODUCTION INCLUDING PLANTATION CROPS (ICAR)

Importance, scope and present position of fruit and plantation corps in India, Practices involved in the production of truits : Mango, Guava, Kagzi lime, banana, Grape, Litchi, Papaya, Loquat, Aonla, Ber, Jack Fruit, Apple and Peach; Production techniques of plantation crops : Coconut, Cashew nut, Tea and coffee.

Practical

Identification of fruits; and plantation crops; Orchard layout and palnting; Practice of different propagation methods with special reference to fruits; Practice of training and pruning of fruit plants; Plant protection practices; visit to orchards, nurseries and research centers of fruits and plantation crops.

B.Sc. Ag., SEMESTER-V

Sl. No.	Department	Credit Hours	Title of the course
1.	Botany	1+1=2	Introduction to plant biotechnology
2	Dairy	2+1=3	Milk and milk processing, principles of food science and human nutrition (ICAR)
3	Horticulture	2+1=3	Preservation of fruits and vegetables post harvest management of fruits and vegetables (ICAR)
4	Entomology	2+2=4	Crop pests and integrated pest management crops pests and management (ICAR)
5	Agronomy	1+1=2	Weed management.
6	Pathology	2+2=4	Crop disease and their management plant pathology : crop diseases and management (ICAR)
7.	Soil Chemistry	2+1=3	Soil fertility, fertilize and integrated nutrient management (ICAR)

Course- I

Semester- V **1+1=2**

INTRODUCTION TO PLANT BIOTECHNOLOGY

1. Definition scope and importance of plant biotechnology.
2. Outlines of basic steps involved in plant, biotechnology/genetic engineering such as:
   - (a) Isolation of plant DNA and vector DNA
   - (b) Restriction of DNA of endonucleasses.
   - (c) Electrophoresis of restricted DNA fragements.
3. Cloning vectors for recombinant DNA such as-
   - (a) Ti-plasmic vector for higher plants.
   - (b) Plant viruses such as cauliflower mosaic virus (Ca MV), tobacco mosaic virus (TMV) and gemineae virus as vectors.
4. Application of plant genetic engineering in crop improvement.
5. Plant tissue culture.
   - (i) Culture media used in plant tissue culture.
   - (ii) Somaclonal and gametoclonal variation in plants.
   - (iii) Micro-propagation of plants.
   - (iv) Application of plant tissue culture in crop improvement.

Semester- V **1+1=2**

MILK AND MILK PROCESSING PRINCIPLES OF FOOD SCINCE AND HUMAN NUTRITION (ICAR)

1. Milk and its secretion, composition of colostrums and milk of differect species. Physical properties of clostrum, cow and buffalo milk. Factors affecting the quantity and quality of milk produced. Clean milk production, microorganism of milk and their functions. Agencies engaged in handling and transportation of milk pricing of milk.
2. Processing the milk. Filteration, Clarification bactofugation pasteurization ultra high temperature treatment, homogenization, sterillzation, cooling and chilling of milk. Membrane filteration and revese oxmosin processes. Common adultery ants and preservatives used in milk and their detection.

Practical

1. Sampling of milk
2. Determination of specific gravity by lactometer and west phal balance. Fact test by Gerber's method solid and SNF percentage by Richmond's scale and formula.
3. Assessment of quality of milk by simple casts like C.O.B. Alcohal test, and Sediment test.
4. Determination of acidity of milk.
5. Calculations on standardization and adultereation of milk.
6. Detection of common milk adulterants.

Course-III

Semester- V **1+2=3**

PRESERVATION OF FRUITS AND VEGETABLES POST HARVEST MANAGEMENT OF

Importance and scope of post harvest management of fruits and vegetables post, harvest deterioration of fruits and vegetables Techniques of prolonging the life of fruits and vegetables; handing grading and packing of fruits and vegetables.

Fruits Preservation

Causes of Spoilage of Fruits and Vegetables principles and methods of fruits and vegetables preservation canning of pea; Dehydration of fruits and vegetables; tomato products; jam, jelly and squash; preserve of Aonla and Bael; pickles of mango citurs, chillies and mixed vegetables.

Practical

Practical knowledge of harvesting, handling, grading. Precooling, waxing and use of chemicals to prolong the post harvest life of fruits and vegetables. Visit to storage and centers carrying improved practices of post harvest handling.

Bottling of green peas; dehydration of seasonal fruits and vegetables, preparation of apple jam, guava and karonda jellies; preparation of lime and orange squashes, Aonla and Beal preserve. Tomato Juice and ketchup.

Course-IV

Semester- V **2+2=4**

CROP PESTS AND INTEGRATED PEST MANAGEMENT

CROPS PESTS AND MANAGEMENT (ICAR)

1. Basic principles of pest out- breaks and their economic status.
2. Methods of insect control; including mechanical. Physical, cultural, biological, legal and chemical control use of insecticides repellents and antifieedants. Attractants. Chemosterilants. Pheromones, insect growth regulators.
3. Basic concept of integrated pest management.
4. Elementary knowledge of plant protection equipments.
5. Plant protection organization at the state and national level.
6. General account of non-insect pests with particular reference to rodents. Naeatodes. Mites and mollusks.
7. Insect vectors transmitting plant diseases.

Practical

1. Collection and preservation of established predators and parasistes.
2. Field and laboratory acquaintance with non-insect pests and their damaged materials.
3. Dilution and application of insecticides.
4. Handling of plant protection equipments.
5. Practical record and viva-voce.

Course-V

Semester- V **2+2=4**

WEED MANAGEMENT

(A) Definition, classification and general characteristics of weeds, Losses caused by weeds.

(B) Principles and methods of solving weed problem.

(C) Weed control schedules for important field corps of U.P.

(D) Integrated weed management system and its importance.

(E) Control of Abnoxious weeds viz. Sedge grass, Kane, Baisuri and satyanasi.

1. Identification and preservation of important weeds of locality.
2. Calculation on quantities of herbicides, weed control efficiency and weed index.
3. Calculation of cost involved in different weed control schedules.

Course-VI

Semester- V **2+2=4**

CROP DISEASE NAD THEIR MANAGEMENT PLANT PATHOLOGY: CROP DIEASES AND MANAGEMENT (ICAR)

1. General Symptoms of plant diseases.
2. Methods of plant diseas control.
3. Preliminary knowledge of different groups of fungicides.
4. Study of the symptoms, etiology, mode of perpetuation and control of the following disease:
   - (i) Early and late blights of potato.
   - (ii) White rust of crucifers.
   - (iii) Green ear disease and Ergot of bajra.
   - (iv) Powdery mildew, loose smut, karnal bunt and rusts of wheat.
   - (v) Coveredd smut of barely.
   - (vi) Grian smut of Jowar
   - (vii) Bajra smut
   - (viii) Rust of linseed
   - (ix) Let shos of tikka disease of groundnut
   - (x) Wilt of arher
   - (xi) Stripe diease of barely
   - (xii) Red rot of sugarcane
   - (xiii) Blast of rice.
   - (xiv) Citrus canker
   - (xv) Kharia disease of paddy and Black tip of mango.
   - (xvi) Tobacco mosaic
   - (xvii) Yellow vein mosaic
   - (xviii) Yellow vein mosaic of bhindi
   - (xix) Bean common Mosaic
   - (xx) Mosaics of potato
   - (xxi) Little leaf of brinjal.

Practical

(i) Diagnosis of important disease by studying symptoms.

(ii) Microscopic examination of diseased parts.

(iii) Preparation of Bordeaux mixture.

(iv) Practical record

(v) Viva voce.

Course-VII

Semester- V **2+1=3**

SOIL FERTILITY, FERTILIZES AND INTEGRATED NUTRIENT MANAGEMENT (ICAR)

1. Soil fertility concept, soil productivity, cactors influencing soil fertility, maintenance of soil productivity.
2. Essential plant nutrients, Criteria of essentiality, functions, deficiency Symptoms, Critical levels of deficiency and toxicity.
3. Mechanism of uptake and transport of minerals salts in plants.
4. Soil fetility evaluation, soil and plant analysis, tissue tests.
5. Mineralization and immoblilization of N and fixation and availability of P and K in soil.
6. Fertilizers- definition, classification, characteristics, reactions of fertilizer in soil, important fertilizer elements- Nitrogen, phosphorus, potassium, sulphur, zinc, Mixed and complex fertilizers Manufacture of urea, ammonium sulphate, superphoshate and marinate of potash. Organic sources of nutrients, digested sludge, manure, compost and green manures.
7. Elementary idea of biofertilizers.
8. Integrated nutrient management (INM) concept. Elementary idea of INM models, integrated nutrient management and soil health.

Practical

Analysis of N. P. and K in fertilizers. Determination of availability of NPK and S in soil. Elementary idea of determination of micronutrients in soil. Plant Tissue tests.

B.Sc. Ag., SEMESTER-VI

Sl. No.	Department	Credit Hours	Title of the course
1.	Botany	1+1=2	Principles of seed technology oil seed and commercial corps (ICAR)
2	Dairy	2+1=3	Dairy products technology
3	Engineering	2+1=3	Post Harvest Engineering.
4	Agronomy	2+0=2	Farming system and sustainable agriculture crop planning farm manage and sustainable agriculture. (ICAR)
5	Agriculture Economic	2+1=3	Agriculture Finance, Business management and trade
6	Agriculture Extension	2+1=3	Communication, Diffusion of agriculture innovation History and development of agri. Research and communication and difiusion of agri. Innovation (ICAR)
7.	Pathology	0+1=1	Plant Pathology: Mushroom cultivation Mushroom culture and elementary plant nemeology (ICAR)

Course-I

Semester- VI **1+1=2**

PRINCIPLES OF SEED TECHNOLOGY OIL SEED AND COMMERCIAL CROPS- (ICAR)

1. History and importance of seed technology.
2. Classes of seeds.
3. Characteristics of quality seeds and its importance.
4. General technique of seed production in important agricultural crops.

(i)	Cereals	-	wheat, rice, barley
(ii)	Pulses	-	maize, sughum and bajra
(iii)	Pulses	-	chichkpea, pigeonpea, fieldpea, urdbean, mung bean and lentil
(iv)	Oil Seeds	-	raps seed, mustard, groundnut, sesamum, Castor, sunflower and soybean.
(v)	Commercial corps	-	sugarcane, jute and coconut.

5. Factors affecting seed longevity and quality.
6. Causes of seed deterioration with reference to genetic and storage.
7. Seed resting- importance, procedures, purity, viability and germination.
8. Certification procedure for important filed crops.

Practical

1. Maintenance of seed purity in the field.
2. Field inspection procedure in important crops.
3. Demonstration of seed processing of important corps.
4. Viability and vigour test.
5. Analysis of purity, moisture and germination of seed samples and communication of results.

Course-II

Semester- VI **2+1=3**

DAIRY PRODUCTS TECHNOLOGY

1. Definition, composition and method of manufacture of cream, butter, dahi, khoa, Chhena, Ice cream, condensed milk powder, cheddar and cottage chease, common adulterants of Ghee and khoa and their detection, cleaning and saitization of dairy equipments.
2. Basic principles of refrigeration and cold storage of milk products, Principles. Of cooling and heating head transfer equipments.
3. Nutritive value to milk and milk products.

Practical

1. Demonstration of cream separation.
2. Demonstration of preparation of butter, Ghee, Khoa, Chhena, Ice Cream and dahi.
3. Calculation on Ice cream mix.
4. Calculation on standardization and Neutritralization of cream, run of butter and ice cream.
5. Comparative study of cost of different milk products.

Course-V

Semester- VI **2+1=3**

POST HARVEST ENGINEERING

1. Importance and advantages of processing of agriculture produce.
2. Study of process and equipments involved in cleaning drying. Storage of farm produce. Rice milling, Pulse-milling, wheat milling, oilseed milling, soyabeen processing cane- crushing, Chaff cutting and animal feed grinding.
3. Utilization of agricultural by products such as rice husk and straws, rice bran and Arhar Stalk.
4. Processing and Preservation of foods and seeds.
5. Biomethanation of agricultural and municipal wastes.

Practical

1. Determination of moisture content of grains.
2. Sieve analysis of ground materials.
3. Study of construction, operation, care and maintenance of different processing equipments.
4. Study of Biogas Plants.
5. Visits of place related to processing of farm produce.

Course-IV

Semester- VI **2+0=2**

FARMING SYSTEM AND SUSTAIBLE AGRAICLTURE CROP LANNING FARM MANAG AND SUSTANBALE AGRI (ICAR)

1. Farming systems- Definition, types and methods of farming.
2. Divination, scope and advantage of sustainable agriculture.
3. Modern agriculture in relation to sustainable agriculture.
4. Sustainable agriculture in relation to tillage fertilizers, irrigation, weed management and plant protection measures.
5. Important cropping systems for sustainable agriculture.

Course-V

Semester- VI **2+1=3**

AGRICULTURAL FINANCE, BUSINESS MANAGEMENT AND TRADE

A. Agricultural Finance

1. Credit, Meaning, Importance and credit control.
2. Definition, need for finance in agriculture, characteristics of good agriculture finance (credit)
3. Decision on the use of credit, Principles of farm credit (Equity or increasing Risk, Added Cost and Added Return, Cost of Credit and no loss no profit goal of farming and opportunity cost Principle)
4. Types of loans and classification of agricultural credit.
5. Qualifications of a borrower, Analysis and three R's and crdit (Return, Repayment Capacity and Risk-Bearing Capacity). Analysis of three G's of credit (character, capacity and capital).
6. Types of loan, according to liquidity, budgeted loan, loan amortization, Even payment method, Decreasing method.
7. Crop index reflecting use and farm finance.
8. Role and Rural Credit Institutions (Recommendations of the Banking Commission integrated Scheme of Rural Finance (Credit), Institutional Agencies, Taccan.
9. Sources of agricultural finance (Commercial banks, RRB, Lead Bank, Lead) Bank, NABARD, Cooperative Credit (PACs, Land Development Banks, National cooperative Federation, Farmers Service Cooperatives).

B. Business Management

1. Meaning of management, functions of management role of mangers and scope of management in agricultural business. Role and objectives in management references.
2. Decision making by individuals as also by groups.

3. Functional areas of management and their relationship with agriculture production, finance, marketing and human resources as coordination thereof.
4. Importance and nature of planning, useful generalization of planning forecasting technique with the help of a planning model, components of management, a technique for planning use of manager's owntime.
5. Leadership in Management, Types an Leadership for production, planning and control activities (inventory control quality control, cost control) and financial management, financial forecasting and planning acquisition of funds.
6. Acquaintance of book-keeping and cash accounts(s).

Knowledge of business environment for operation of bank account cheques, bank draft etc.

Course-VI

Semester- VI **2+1=3**

COMMUNICATION, DIFFUSION OF AGRICULTURE INNOVATION HISTORY AND DEVEL OF AGRI, RESEARCH AND DIFFUSION OF AGRI INNOVATION (ICAR)

Meaning and definition of communication. Communication process, elements and models of communication process. Types of communication. Key communicator Audio visual aids, their use and effectiveness.

Extension teaching methods- classification, merits and demerits, factors affecting selection and use of extension teaching methods,. Mass Media in Extension.

Meaning and definition of innovation, diffusion, adoption, diffusion effect and rate of adoption, stages of adoption, factors affection adoption, elements of difference between diffusion and communication. Innovation decision process, categories of adopters, characteristics of innovations.

Practical

1. Preparation, procurement and handling of aids.
2. Organizing group discussion, campaign, seminar, exhibition and demonstration.
3. Practices in writing news letter, circular letter, radio and television scripts on different farm practices.
4. Identification of farmers and their categories them in to different adopters categories.
5. Collection of information from farmers regarding different characteristics of innovations.
6. Collection of data regarding rate of adoption for the adoption of different farm practices in different years.

Course-VII

Semester- VI **0+1=1**

PLANT PATHOLOGY: MUSHROOM CULTIVATION MUSHROOM CULTURE AND LELEMENTARY PLANT NEMEOLOGY (ICAR)

Morphology of edible mushrooms and their classification. Swawn and its preparation. Methods of Cultivation of different types of edible mushrooms. Mushroom diseases and ests. Mushroom recipies.

Practical

(i) Practical record

(ii) Viva voce

Course-IV

Semester- VI **2+1=3**

ORNAMENTAL HORTICULTURE

Importance and scope of ornamental horticulture in India. Cultivation of annuals and canna. Commercial cultivation of rose, chrysanthemum, marigold and gladiolus; Making and maintenance of Lawn; Making and maintenance of Hadge and deging; Elementary Knowledge of common shrubs, climbers and trees and their various uses. Indoor gardening; Styles of gardens with special reference to Moghul and Japanese gradens: Flower arrangement and techniques to prolong vase life of flowers.

Practical

Identification of ornamental plants : Preparation of herbaceous border ; Practice of making garlands, Bouquet and arrangements in vases; Propagation of ornamental plants; Practice of potting and repotting of plants. Visit to ornamental gardens and research station.

B.Sc. Ag., SEMESTER-VII

Sl. No.	Department	Credit Hours	Title of the course
1.	Agriculture Extension	1+1=2	Rural agricultural work experience all departments related in field work
2	Agriculture Economic	1+1=2	
3	Agriculture Botany	0+1=1	
4	Agriculture Chemistry	0+1=1	
5	Agriculture Dairy	0+1=1	
6	Agriculture Engineering	0+1=1	
7	Agriculture Horticulture	0+1=1	
8	Agriculture Soil conservation	0+1=1	
9	Agriculture Agronomy	0+1=1	
10-	Agriculture Paint Pathology	0+1=1	
11	Agriculture Entomology	0+1=1	

Semester- VIII

RURAL AGRICULTURAL WORK EXPERIENCE

It is often complained that the agricultural graduates lack professional competence and cut a shy figure in facing farmers. Keeping this in view the rural agricultural work experience (RAWE) is included in the programme. Where students will be exposed to rural (Village) environment for strenghtening practical training group of students will be associated to farmers. Agro- industrial units and agricultural research station for this purpose for a period of 3-4 months they will be constantly supervised and evaluated by the faculty and a detailed report of the survey and works of the students for the period is to be submitted by him.

B.Sc. Ag., SEMESTER-VIII

Sl. No.	Department	Credit Hours	Title of the course
1.	Agronomy	2+1=3	Rainfed Agriculture Dry land forming and water shed management (ICAR)
2	Soil conservation	2+1=3	Silviculture and agroforestry Agro forestry and special forestry (ICAR)
3	Horticulture	1+1=2	Production technology of medicinal aromiatic and spices crops Plant corps spices medicinal and aroma crops (ICAR)
4	Agriculture Soil Chemistry	2+1=3	Management of problems soils and water land
5	Animal husbandry and dairy	2+1=3	Dairy Chemistry and animal nutrition animal nutrition including fortage and grasses (ICAR)
6	Computer	1+1=2	Computer Applications

Semester- VIII **2+1=3**

RAINFED AGRICULTURE
DRY LAND FORMING AND WATER SHED MANAGEMENT (ICAR)

1. Definition, Characteristics and extent of rainfed/dry alnd farming areas in the country and the state of U.P.
2. Problems in dryland agriculture.
3. Moisture conservation practices and use of antitranspirants in dryland farming.
4. Watershed management concept, Principles and practices.
5. Selection of suitable crops, crop relations and crop mixtures for various categories of rainfed reas.

Practical

1. Preparation of crop rotations and cropping schemes for rainfed farming and dry land agriculture.
2. Determination of Soil Moisture constants.
3. Studies on moisture depletion pattern and rainfed farming.
4. Study of practical application of antitiranspirants.
5. Visit to Dry farming research stations.
6. Maintenance of practical record.

Semester- VIII **2+1=3**

SILVICLTURE AND AGROFORESTRY AGRO FORESTRY AND SPECIAL FORESTRY (ICAR)

(A) Silviculture:

1. Definition and scope of silviculture, Forestry, its scope and classification.
2. Role of forests- geographic, productive and bioaesthetical.
3. Elementary idea of forest types.
4. Regeneration of forests.
   (a) Natural seed production, seed dispersal, germination and seedling establishment.
   (b) Artificial Afforestation, reforestation and their objectives. Choice of tree species nursery techniques.

(B) Agroforestry

1. Definition, concept and need of agro forestry.
2. Classification of agro forestry systems.
3. Prominent agro forestry system prevailing in Uttar Pradesh.
4. Limitaions of agro forestry, choice of tree species for agro forestry for fuel, fodder and timber requirement.

Practical

1. Afforestation, techniques of problematic sites viz. ravines, saline-alkali soils, waterlogged areas, arid areas, hilly areas; roadside and canal bank plantation
2. Nursery techniques- Numerical problems.
3. Numerical problems on planting and cost of earthwork estimation.
4. Identification of forest tree species.

Semester- VIII **1+1=2**

PRODUCTION TECHNOLOGY OF MEDICINAL AROMIATIC AND SPICES CROPS PLANT CROPS SPICES MEDICINAL AND AROMA CROPS (ICAR)

1. Importance and scope of medicinal, aromatic and spices crops.
2. Cultivation of menthe, citronella, Khus, Ocimum, Rauvolifia and Dioscoria.
3. Cultivation of turmeric, Zinger, Coriander, Zira and Saunf in the North Indian Condition.

Practical

1. Identification of medicinal and aromatic plants.
2. Calculation of the cost of cultivation of menthe, citronella, Rauvolfia and Dioscorea.
3. Practical, Identification and demonstration of spices in the course.
4. Visit to commercial growing places and research stations of the medicinal, aromatic and spices crops.

Semester- VIII **1+1=2**

MANAGEMENT OF PROBLEM SOIL AND WATER LAND

Management of Problem soil

1. Saline and sodic soils- Occurrence classification, formation, diagnosis, characteristics and management.
2. Acid Soils- occurrence, formation, diagnosis, characteristics and management.
3. Waterlogged soils- occurrence, characteristics and management.
4. Eroded soils: Occurrence characteristics and management.

Management of Wasteland

5. Definition, classification, distribution and extent of wastelands in India with particular reference to U.P. and their Management.
6. Factors responsible for land degradation and characteristics of different types of wastelands.
7. Soil Management in Arid and Semiarid areas and sand dune Stabilization.

Practical

1. Determination of pH, EC, gypsum requirement, lime requirement in problem soil.
2. Determination of specific gravity, bulk density, pore space, soil texture.
3. Visit to Area of problem soil.

Semester- VIII **1+1=2**

DAIRY CHEMISTRY AND ANIMAL NUTRITION ANIMAL NUTRITION INCLUDING FORTAGE AND GRASSES (ICAR)

Unit-1 The milk and colostrums, secretion of milk, chemical composition and physio-chemical properties of milk and colostrums, chemical changes occurring during storage of milk, Preservation of milk. Adulteration of milk and its detection.

Unit-II Chemistry of milk constituents viz. lactose, fat protein, enzymes and vitamins.

Unit-III Classification of feeding stuffs, composition of Animal body and feeds, Functions of food constituents, the digestion and absorption of food constituents in ruminates

Unit-IV The metabolism of fat, carbohydrate and protein.

Unit-V Role of minerals, harmons, vitamins and Antibiotics in animals feeding with special reference to deficiency diseases.

Practical

1. Sampling of milk
2. Analysis of milk for TS, SNF, Fat, Total ash, Calcium and Phosphorus,
3. Determination of lactose in milk and proteins.
4. Analysis of feeds for total ash, CaO_1 P_2 O_5 and Proteins.
5. Demonstration of estimation of Ether Extract and crude fibre in feeds.

Course

Semester- VIII **1+1=2**

COMPUTER APPLICATION

Introduction to computer. A brief history of computing. Data Processing and information. Use. Definition, Anatomy, Components, Classification of computers. Capability and limitation of computer. Number systems. Decimal. Binary, octal, hexadecimal. Character codes. ASCH, EBCDIC, BCD. Computer organization-CPU, Input-output devices. Various types of memories. Introduction to DOS (Disk operating system). Fundamentals of DOS commands, Internal, External, Editor, Files and Directory, Elementary Idea of Basic (Computer Language).

Practical

Simple Programming Exercises in BASIC

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

Syllabus & Evaluation Scheme

B.Voc

Bachelor of Vocational Studies

(Bachelor of Vocation)

3-Year Undergraduate Course

Based on

AICTE MODEL CURRICULUM

(EFFECTIVE FROM THE SESSION: 2019-20

CONTENTS

Sr. No	Topic	Branch Code
1	Automotive Manufacturing Technology (AM)	101
2	Automobile Servicing (AS)	102
3	Production Technology (PT)	103
4	Industrial Tool Manufacturing (IM)	104
5	Refrigeration and Air Conditioning (RC)	105
6	Software Development (SD)	106
7	Graphics & Multimedia (GM)	107
8	Banking Finance Services and Insurance (FS)	108
9	Electronic Manufacturing Servicing (EM)	111
10	Medical Imaging Technology (MI)	112

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Automotive Manufacturing Technology (AM)
Branch code:101

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme
B. VocAutomotive Manufacturing Technology

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BAMV511	Motor Vehicle Technology –I		10	5	5	20	30		**50**	**2**
2	BAMV512	Automobile Electrical Equipment	30	10	5	5	20	30		**50**	**2**
3	BAMV513	Two and Three Wheeler	30	10	5	5	20	30		**50**	**2**
4	BAMV514	Modern Electric & Hybrid Vehicles	30	10	5	5	20	30		**50**	**2**
5	BAMP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BAMP512	Electric & Hybrid Vehicles Lab	30				20		30	**50**	**1**
7	BAMP513	Language Lab	30				20		30	**50**	**2**
8	BAMT 511	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BAMT 512	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAMT 513	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAMT 514	Tool Designer (ASC/Q4001)									
	BAMT 515	Equipment Designer L5 (ASC/Q 6405)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BAMV521	Total Quality Management	30	10	5	5	20	30		**50**	**2**
2	BAMV522	Motor Vehicle Technology –II	30	10	5	5	20	30		**50**	**2**
3	BAMV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BAMV524	Rapid Prototyping & Reverse Engineering	30	10	5	5	20	30		**50**	**2**
5	BAMP521	Project	30				20		30	**50**	**1**
6	BAMP522	Engineering Graphics	30				20		30	**50**	**1**
7	BAMP523	Mechanical Workshop Practice Lab	30				20		30	**50**	**2**
8	BAMT521	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BAMT522	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAMT523	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAMT524	Tool Designer (ASC/Q4001)									
	BAMT525	Equipment Designer L5 (ASC/Q 6405)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV631	Automobile Electrical System	30	10	5	5	20	30		50	2
2	BAMV632	Automobile Drawing & Design	30	10	5	5	20	30		50	2
3	BAMV633	Automobile Engines	30	10	5	5	20	30		50	2
4	BAMV634	Mass Production Devices	30	10	5	5	20	30		50	2
5	BAMH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BAMP631	Automobile Workshop - I	30				20		30	50	1
7	BAMP632	Tool & Die Making Lab.	30				20		30	50	1
8	BAMT631	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training 400 hrs/ 8 weeks			150	12
	BAMT632	Automation Specialist (ASC/Q6807)									
	BAMT633 BAMT634	Assembly Line Machine Setter (ASC/Q3603))									
		Process Design Engineer (ASC/Q6404)									
	BAMT635	Quality Controller (ASC/Q1605)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV641	Automobile Engine Systems	30	10	5	5	20	30		50	2
2	BAMV642	Automotive Refrigeration and Air Conditioning	30	10	5	5	20	30		50	2
3	BAMV643	Vehicle Performance and Testing	30	10	5	5	20	30		50	2
4	BAMV644	Electrical & Hybrid Vehicles – II	30	10	5	5	20	30		50	2
5	BAMH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BAMP641	Automotive RAC Lab	30				20		30	50	1
7	BAMP642	Vehicle Performance and Testing Lab	30				20		30	50	1
8	BAMT641	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			150	12
	BAMT642	Automation Specialist (ASC/Q6807)									
	BAMT643	Assembly Line Machine Setter (ASC/Q3603))									
	BAMT644	Process Design Engineer (ASC/Q6404)									
	BAMT645	Quality Controller (ASC/Q1605)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV751	Automotive System Design	30	10	5	5	20	30		50	2
2	BAMV752	Plant Layout & Product Handling	30	10	5	5	20	30		50	2
3	BAMV753	Industrial Engineering& Safety Engineering	30	10	5	5	20	30		50	2
4	BAMV754	CAD & CAM	30	10	5	5	20	30		50	2
5	BAMH751	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BAMP751	CAD&CAM Lab	30				20		30	50	1
7	BAMP752	Design of Automotive Systems Lab	30				20		30	50	1
8	BAMT751	Spare Parts Operations In charge (ASC/Q1503)					Any one Training 400 hrs/ 8 weeks			150	12
	BAMT752	Body Shop In-Charge (ASC/Q1413)									
	BAMT753	Service Supervisor (ASC/Q1412)									
	BAMT754	Testing Manager (ASC/Q8405)									
	BAMT755	Product Design Manager L7 (ASC/Q8103)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAMV761	Vehicle Safety	30	10	5	5	20	30		50	2
2	BAMV762	Agile & Lean Manufacturing Systems	30	10	5	5	20	30		50	2
3	BAMV763	Process Planning & Control	30	10	5	5	20	30		50	2
4	BAMP761	Major Project	180						150	150	6
5	BAMT761	Spare Parts Operations In charge (ASC/Q1503)				Any one Training (other than 5thsem) 400 hrs/ 8 weeks				200	12
	BAMT762	Body Shop In-Charge (ASC/Q1413)									
	BAMT763	Service Supervisor (ASC/Q1412)									
	BAMT764	Testing Manager (ASC/Q8405)									
	BAMT765	Product Design Manager L7 (ASC/Q8103)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Motor Vehicle Technology – 1

UNIT-I :
Introduction & Chassis Layout
General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle, their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

UNIT-II:
Clutch System
Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque transmitted by clutch, simple numerical problems. Clutch defects, probable causes, remedies.

UNIT-III:
Gear Box
Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheels drive auxiliary gear box. Gear ratio

UNIT-IV:
Final Drive
Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio. Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

UNIT-V:
Wheels and Tyres
Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyre pressure, Advantages of filling nitrogen in tyres.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology ,David R. Rogers, Peter Coombes, and Victor Albert Walter Hillier

Automobile Electrical Equipment

UNIT-I:

Automobile Wiring Systems & Cables

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems, Positive and negative earthing, Cables-starting systems cables, general purpose cables and high-tension cables; specifications and colour codes, Diagram of a typical wiring system, Wiring harness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits, Fuses in circuits.

UNIT-II:

Storage Battery

Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound, Electrolyte: specific gravity of electrolyte and its variation with temperature, Effect of charging and discharging of specific gravity, Capacity of battery, Efficiency of battery,Methods of charging of battery, Internal circuit of battery charger, Care and maintenance of batteries, Checking for cell voltage and specific gravity of electrolyte, Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test, Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery, Alkaline type batteries, Fuel cell and its types, Battery Life enhancer.

UNIT-III:

Dynamo

Principle of generation of D.C. Constructional details of a Dynamo, Armature reaction, Principle of commutation, Construction of commutator, Types of wound field generatorseries, shunt and compound wound. Other types of D.C. generators-four brush & four pole, interpole, split field and bucking field,Dyna-Starter, Generator drive.

UNIT-IV:

Alternator

Principle of generation of A.C. Constructional details of an alternator, Working of alternators, Advantages over dynamo, Types of alternators, Charging of battery with an alternator, Regulator for alternators.

UNIT V:

Regulators

Constant current and constant voltage systems, Double-contact and compensated voltage control regulators. Current-and-voltage regulator, Cut-out.

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge 4. Automotive Electrical Equipment: WH Crouse

Two and Three Wheeler

UNIT-I: The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

UNIT-II: Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system,Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System,Starting system - Kick starter system – Self-starter system, recent technologies

UNIT-III: Chassis and Sub-Systems

Main frame for two and three wheelers, its types, Chassis and different drive systems for twowheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear control sin two wheelers, Front and rear suspension systems, Shock absorbers, Panel meters and controls on handle bar, Freewheeling devices

UNIT-IV: Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links layouts.

Brake actuation mechanism,Spoked wheel, cast wheel, Disc wheel & its merits and demerits,Tyres and tubes Construction & its Types, Steering geometry

UNIT-V: Two & Three Wheelers – Case Study

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer, Servicing and maintenance, recent developments

Reference Books:

1 .Two and three wheeler technology, dhruv u. Panchal

Modern Electric and Hybrid Vehicles

UNIT-I: Introduction

Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics

UNIT-II: Electric and Hybrid Electric Drive Trains

Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages and disadvantages

UNIT-III: Power Flow

Power flow control in electric and hybrid electric drive train topologies.

UNIT-IV: Electric Drive Components

Introduction to electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.

UNIT-V: Regenerative Braking System (RBS)

Introduction and need of Regenerative Braking System, Advantages and disadvantages of RBS, Working of RBS, Concept of Regenerative Braking using Piezoelectric material, Using shock absorbers as vibration energy harvesters.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Automotive Fuel Technology-Electric, Hybrid and Fuel-Cell Vehicles: Jack Erjavec& Jeff Arias
3. Electric and Hybrid Vehicles: Design Fundamentals: Iqbal Husain
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design: Mehrdadehsani, Yimingao, AliEmadi.

Metrology and Measuring Instruments lab

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of autocollimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Electric and Hybrid Vehicles Lab

1. Understand working of different configurations of electric vehicles
2. Understand hybrid vehicle configuration and its components, performance analysis
3. Understand the properties of batteries and its types
4. Understand of electric vehicle drive systems.
5. Understand of hybrid electric vehicles.
6. Understand Auxiliary systems including charging, starter motor, on board power supply, lighting and environmental sensing and conducting repairs. Repair & Replacement of Electric/ Hybrid Vehicle body
7. Repair & Replacement of Electric Vehicle Drive Train
8. Fault diagnosis & repair / replacement of Battery, DC & AC Electrical Machines, and Hybrid Electric Vehicles.

Level 5 (Semester II)

Total Quality Management

1. Introduction, Basic concepts of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5–'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

Motor Vehicle Technology - II

UNIT-IFrame and Body

Function and construction of frame, Cross-section of frames, Unitized construction (monocoque) types of bodies, Terms - Turning radius, lock-to-lock angle, centre point steering, positive steering, gradeability, Idea of Safety features in a modern car.

UNIT-II: Suspension System

Function, Types - conventional and independent, Spring types - coil, leaf - elliptical, semielliptical; helper springs, transverse springs, Spring camber; spring material, Torsion bar, stabiliser bar, Shock absorbers- telescopic and gas,Maruti suspension system and shockers, Anti-roll bars, Nitrox suspension.

UNIT-III:Steering System and Front Axle

Principle - Ackermann and Davis, Function, requirements, Steering gear box – types, Construction and working details of worm and sector, rack and pinion, worm and wheel, worm and recalculating ball type, Tractor steering, Power steering, Electronic Steering, Front axle - rigid front axle, Stub axle, Elliot and reverse elliot type,Lemoine and reverse lemoine type, Tractor front axle, Maruti steering system, Wheel alignment - castor angle, camber angle, K.P.I., Toe-in, toe out, General values of these.

UNIT-IV: Braking System

Braking terms - braking efficiency, stopping distance, stopping time, weight transfer during braking, leading/trailing shoe of brake,Determination of braking torque, Effect of braking on steering, Types of braking systems- constructional details and working of mechanical brakes, hydraulic brakes, parking brake, vacuum, pneumatic, air-hydraulic brakes; tractor brakes, Drum and disc brakes, Master cylinder, tandem master cylinder, wheel cylinder, Brake lining and brake fluid, Brake defects, their causes and remedies,Anti-Lock Braking System (ABS) & Electronic Brake Distribution (EBD).

UNIT-V: Automobile Pollution and Its Control

Effects and extent of pollution caused due to stationary and automobile engines, Harmful products and their causes in petrol & diesel engines, Measures to control exhaust emissions from two-stroke engines, four-stroke engines, and diesel engines, Turbocharger, Products which cause de-activation of catalysts in catalytic converters, Unleaded petrol, Emission measuring instruments for petrol and diesel engines. Limits specified in Motor Vehicles Act. Recent trends in Automobile Pollution Control- Exhaust Gas Recirculation, Air Injection, Reactor System, Positive Crankcase Ventilation,and Evaporative Emission Control System.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House

Material Science & Materials

UNIT-I:General:
Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importanceTheir chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

Structure of Metals and their Deformation:
Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

UNIT-II:Metals-Ferrous Metals
1. Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications
(d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT-III:NON-METALIC MATERIALS
Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics
Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.
Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT-IV:Identification and Testing of Metal Alloys:
Selection, specification forms and availability of materials.

Heat Treatment of Metals:
Elementary concept, purpose, Iron-carbon equilibrium diagram T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:
1 .MATERIAL SCIENCE: RS Khurmi& RS Shedha
2.Materials Science and Engineering,WilliamCallister

Rapid Prototyping & Reverse Engineering

UNIT-I:Introduction:
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT-II:CAD Modelling and Data Processing for RP:
CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT-III:RP Systems:
Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes, Extrusion - Based RP Systems, 3D Printing process modeling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

UNIT-IV:Rapid Tooling:
Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

UNIT-V:RP Applications:
Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Reference Books:
1. Reverse Engineeringby Kiran J. Fernandes (Editor), Vinesh Raja (Editor)
2. Rapid Prototyping - Theory and Practice | Ali K. Kamrani | Springer

Project

On the basis of learning in the vocational diploma, a project to be taken up by the student strengthening his/ her vocational skills

Engineering Graphics

1. Introduction

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP.Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2. Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

3. Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of Tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut Spheres.

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same
2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra&Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (Semester I)

Automobile Electrical System

UNIT-I:STARTING SYSTEM

Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, typical motor specifications

UNIT-II:IGNITION SYSTEM OF SPARK-IGNITED ENGINES

Types of ignition systems- battery and coil, magneto ignition systems, Ignition circuit, Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive, Firing order, Ignition timing, Ignition advance and retard, need, and factors it depends upon, Methods for obtaining advance and retard vacuum and mechanical, Optical sensor for spark timing.

UNIT-III: Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs, Glow plugs of diesel engines, Magneto-rotating armature and rotating magnet types, Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

UNIT-IV: LIGHTING SYSTEM

Requirements of automobile lighting, Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly, Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners, Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs, Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp, Auxiliary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

UNIT-V:ACCESSORIES

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, ampere meter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly, Radio and television Interference suppressors, electrical switches. Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Automotive ElectricalEquipment,Kohli

Automobile Drawing & Design

UNIT-I: Drafting of sectional views of the following assemblies: (a) Cylinder block and crankcase of 2-wheeler, (b) Poppet valve assembly of a 4-stroke engine, (c) Piston assembly, (d) Connecting rod assembly, (e) Spark plug, (f) Injector.

UNIT-II: Free hand line diagram of the following systems: (a) Fuel system of petrol engine (b) Fuel system of diesel engine (c) Cooling system of a multi-cylinder engine (d) Lubricating system of a multi-cylinder engine (e) Steering system of Maruti (f) Suspension systems of Maruti (g) Hydraulic Braking System of Maruti Zen (h) Air Hydraulic Braking System of TATA (i) Block diagram of Electronic Fuel Injection (EFI) system (j) Block diagram of Common Rail Direct Injection (CRDI) system (k) Oxygen sensor (l) Fuel injector of EFI.

UNIT-III: Drafting of sectional views of the following assemblies (1) Master cylinder (2) Wheel cylinder (3) Universal joint

UNIT-IV: Sketch layouts of (a) Depot (b) F.I. pump reconditioning shop (c) Electrical Workshop.

UNIT-V: Design of the following components of an automobile engine (1) Piston assembly (2) Connecting rod assembly (3) Crank shaft (4) Flywheel

Reference Books:

1. Automobile Drawing: RB Gupta

Automobile Engines

UNIT-I:(A)Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat, Conservation of energy, First and Second Law of thermodynamics, P-V diagram, Reversible process, Various thermodynamic processes, Entropy, General case for change of entropy of a gas, Change of entropy during various processes,Temperature-entropy diagram, Simple numerical problem.

(B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle, Effect of compression ratio on efficiency, Simple numerical problem, Graphical representation of ideal and actual cycle, Comparison between actual and ideal cycles, Reasons for variation, Mean effective pressure, Work done during the cycle.

UNIT-II: (A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams, Classification of I.C. Engines. (B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, gaskets, Different cylinder arrangements. Cylinder wear, Forms of combustion chamber in petrol engine, Location of spark plug, Combustion chamber in Diesel engines, Turbulence in Combustion chambers.

UNIT-III:Engines Details (continued)(b) Piston-plain, split skirt, auto-thermic, cam-ground, Anodising and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism, Valve clearance, Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod, Bearing metal for big and small end of connecting rod (g) Crank shaft, Left hand, right hand crankshaft, Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding,. Main bearings Crankshaft end play. Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT**).**

UNIT-IV: Rotary Engine, Principle and operation, Engine cooling, Advantages and limitations. (B) Internal combustion Turbine, Principle of working, Classification, Brayton cycle, Cycle efficiency, Friction effect, Optimum compression ratio, Simple numerical problems, Deviation of practical cycles, Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials, Turbine blades.

UNIT-V: Supercharging and scavenging. Necessity of supercharging, Rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging, Methods and classification of scavenging process, Performance of different scavenging systems. (B) Engine specifications, specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Thermal Engineering I & II: Sarao, Gambhir& Aggarwal
3. Automobile Engineering II: Kirpal Singh
4. Basic Automobile Engineering: CP Nakra
5. Automobile Engineering: RB Gupta

Mass Production Devices

UNIT-I:Tool holders:
Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

UNIT-II:Locating and clamping devices:
Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

UNIT-III: Clamping devices:
Types, Sketches with nomenclature, Working, Applications

UNIT-IV:Jigs and fixtures:
Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures,

UNIT-V: Design of Jigs and Fixtures:
Steps in designing jigs and fixture for given simple component

Reference Books:

1. Mass Production, Products from Phaidon Design Classics
2. Mass-production management,design and operation of production flow-line systems Hardcover – 1972by Ray Wild (Author)

Automobile Workshop -I

UNIT-I: Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, WagonR, Swift (Petrol & Diesel); Hyundai: Santro, Ford: Figo; Volkswagen: Polo; Chevrolet: Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking

UNIT-II: Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerized wheel aligner

UNIT-III: Measurement of Exhaust Pollution by various analyzers such as Four Gas Analyser, Smoke meter, Noxanalyser

UNIT-IV: Use of Headlight aligner, Wheel aligner, automotive oscilloscope

UNIT-V: Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focusing and alignment of head lights

Reference Books:

1. Engine Service: Gary Lewis
2. Various Car's Manuals

Tool & Die Making Lab

1. Manufacture of Box Jig and Angle plate jig
2. Manufacture of "V" Block angle grinding Fixtures and profile milling fixture
3. Manufacture of simple Blanking & piercing Tool
4. Manufacture of Progressive tool for producing a Cycle chain link
5. Manufacture of Press tools like Combination tool & Compound tool
6. Manufacture of Draw tool
7. Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup, Washer and Cycle bell cup
8. Manufacture of simple V and U bending tool 9. Maintenance of Jig & fixture and press tool

Level 6 (Semester II)

Automobile Engine Systems

UNIT-I:STARTING SYSTEM: Idea of engine starting-system circuit, Kick-starting system of 2 wheelers,Starting of mopeds. IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and its working Compression ignition of diesel engines, LUBRICATION SYSTEM: Lubrication in 2 stroke engines - petrol and oil-injection. Lubrication in 4 stroke multi-cylinder petrol/diesel engines, Dry and wet sump lubrication, Full pressure and semi-pressure lubrication, Oil pump types, Oil pump drive, relief valve; pressure gauge. Oil filters, Full-flow and by-pass type filtering system, Crankcase dilution, crankcase ventilation,Positive Crankcase Ventilation, Properties and functions of a good lubricating oil, Additives, Gradation of lubricating oil due to viscosity, SAE numbers, Service rating, 2T and Super 2T oils for use in 2-s engines.

UNIT-II:COOLING SYSTEM: Necessity of cooling of I.C. engines, Methods of cooling-air cooling, water cooling, liquid cooling, Shape of cooling fins, Field of application of air cooling, Water cooling system - Thermo siphon system, pump system, thermostat system of cooling, Thermostat – types, Radiators-different types, their construction and function, Pressurized cooling system; radiator pressure-cap, surge tank, Cooling water temperature gauge, Antifreeze and anti-corrosive additive, Coolants, Flushing of cooling system.

AUTOMOBILE ENGINE FUELS: Types of fuels, Influence of structure, Calorific value, Requirements in fuels for I.C. engines, Properties, Fuel rating, Additives for S.I. and C.I. engine fuels, Specifications of petrol and diesel, Leaded and un-leaded petrol, Low Sulphur diesel, Enhancing Power output- Nitrox injection, Non-conventional fuels - LPG, CNG ethanol-mixed petrol, Properties, method of manufacture and their performance as I.C. engine fuels. Engine modifications required, Dual mode engine, Idea of Electric Vehicles and Hybrid Vehicles.

UNIT-III:FUEL SYSTEM OF DIESEL ENGINES: Fuel supply system,Filters (primary and secondary) positioning of filters, Feed pump, Solid and air injection system, Fuel injection pump, different types-plunger, distributor pump, their construction and working, Injectors, Governors, Types of governing, Combustion process in diesel engine, Diesel knock, Electronically Controlled Diesel Injection Pump, Common Rail Direct Injection, Piezoelectric effect and its use in CRDI.

UNIT-IV:FUEL SYSTEM OF PETROL ENGINES: Gravity feed system used in 2-wheelerS, Fuel supply circuit of 4-wheelers, Mechanical and electrical fuel pump, Electric fuel gauge, Petrol fuel filter, Air/fuel ratio, Variation of air/fuel ratio with speed, Air cleaners (wet & dry), Cyclone filter, CARBURETOR - Function and principle of working of simple carburetor, Carburetor controls- throttle, choke, Types of Carburetors- fixed jet carburetor (Solex type) and constant vacuum carburetors used in YAMAHA motorcycle, Twin-barrel carburetors, Classification of carburetors, Disadvantages of carburetors, Phenomenon of combustion and detonation, Pre-ignition.

UNIT-V:FUEL INJECTION SYSTEMS (PETROL ENGINE): TBI, MPI, the Electronic Module,and Advantages of Electronic Fuel Injection (EFI), Block diagram of the EFI, The Air Intake System and the Idle Air Control System. Fuel Delivery System, Various sensors used with the ECM, their location and purpose, Fuel Injector, Idea of Gasoline Direct Injection ENGINE PERFORMANCE AND TESTING: Various losses in an engine, Heat balance, Morse method of finding IHP, Calculation of various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, specific fuel consumption. Performance curves.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House

Automotive Refrigeration & Air-conditioning

UNIT-I:Refrigeration Fundamentals:

Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air conditioning.

UNIT-II:Refrigerants and Air conditioning Components:

Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination

UNIT-III:Air distribution system:

Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance

Psychrometry: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.

UNIT-IV: Load analysis and control devices:

Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and actuators.

UNIT-V: Diagnostics, Trouble Shooting, Service and Repair:

Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass, Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting, Removing and replacing components, Compressor service.

Reference Books:

1. Refrigeration & Air Conditioning, Sadhu Singh, Khanna Publishing House

Vehicle Performance & Testing UNIT-I:

Vehicle Performance Parameters:

Vehicle Performance parameters: Fuel economy, acceleration, deceleration, grad ability, top speed, handling, comfort, life durability, EGR systems, Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function and construction, Lambda close loop control system for gasoline vehicles.

UNIT-II:Drive train and Component testing:

Vehicular transmission performance: comparison of automotive clutches,Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.

UNIT-III:Vehicle testing:

Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle. Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water Laboratory testing: Testing on chassis dynamometer, transition testing (Euro III onwards), accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test. Collisions and Crash Testing: Crash testing: Human testing, dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.

UNIT-IV:Comfort, Convenience and Safety:

Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system, Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.

UNIT-V: Noise Vibration and EMI:

Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement. Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.

Reference Books:

1. Road Vehicle Performance: Methods of Measurement and Calculation, George Gordon Lucas
2.The Engineering Principles of Vehicle Performance Testing,FrontCover,Fredrick James Furrer

Electrical & Hybrid Vehicles – II

UNIT-I:Hybrid Architecture and Power

Plant Specifications:
Series configuration locomotive drives- series parallel switching- load tracking architecture, Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT) wheel motors, Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.

UNIT-II:Sizing the Drive System and Energy Storage Technology:
Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters

UNIT-III:Fuel Cells:
Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra-capacitors- PEM fuel cell vehicles.

UNIT-IV:Energy Storage:
Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel-Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.

UNIT-V:Nonelectric Hybrid Systems:
Short term storage systems flywheel accumulators, continuously variable transmissions hydraulic accumulator's hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Electric and Hybrid Vehicles, Tom Denton

Automotive RAC Lab

1. Test on vapor compression test rig.
2. Test on air conditioning test rig.
3. Study of various methods of transport refrigeration systems.
4. Study and demonstration on car and bus air conditioning system.
5. Study of latest trends in automotive refrigeration systems.
6. Study and demonstration of controls in refrigeration.
7. Study of different components with the help of cut sections/models/charts- Compressor, Condenser, Evaporators, Expansion device, Blower fans, Hating systems etc.
8. Study of installation/operations/maintenance practices for refrigeration systems.
9. Study of leak testing and leak detection methods.
10. Visit to maintenance shop of automotive air conditioning and writing report on it.

Vehicle Performance & Testing Lab

1. Estimation of power requirement for vehicle propulsion by taking actual vehicle example.
2. Perform coast down test to find vehicle inertia.
3. On road fuel consumption test at different speeds.
4. Brake efficiency measurement
5. Pass- by noise test.
6. Free acceleration test.
7. Vibration measurement in passenger compartment
8. Laboratory testing of vehicle on chassis dynamometer for performance
9. Laboratory testing of vehicle on chassis dynamometer for emission.
10. Report based on visit to vehicle testing and research organization.
11. On road emission testing of petrol and diesel vehicles for PUC/RTO

Level 7 (Semester I)

Automotive System Design

UNIT-I: Design of Clutches & Gearbox:
Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, mutilate clutch and centrifugal clutch. Selection of gear ratios and final drive ratio, numerical on 3- speed and 4- speed gearbox.

UNIT-II: Design of Propeller Shafts and Axles:
Design of propeller shafts for bending, torsion and rigidity, Design of universal joints and slip joints, final drive, Design of live and dead axles.

UNIT-III: Brake Systems:
Design of hydraulic braking system, internal expanding shoe brake and disc brake, design of master and wheel cylinder and piping design.

UNIT-IV: Design of Suspension and Steering System:
General design considerations of suspension system, design of helical and leaf springs for automobile suspension system, design considerations of Belleville springs, elastomeric springs, design considerations of steering system and vehicle frame design.

UNIT-V: Statistical Consideration in Design and Optimization:
Ergonomics and aesthetic design, statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability, introduction to design optimization of mechanical elements, adequate and optimum design, methods of optimization, Johnson's method of optimum design-simple problems in optimum design like axially loaded members.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Plant Layout & Product Handling

UNIT-IObjective of Facility Design: Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

UNIT-IIComputerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.;

UNIT-IIIProduct handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, fork lifters;

UNIT-VI Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

UNIT-V

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

Reference Books:

1. Plant Layout and Materials Handling, R. B. Choudhary, G. R. N. Tagore
2. Plant Layout And Material Handling (Paperback, G.K. Agarwal)

Industrial Engineering & Safety Engineering

UNIT-I:INSPECTION: Inspection and its objective, Types of inspection, Inspection standards, Duties of inspection foreman, QUALITY CONTROL: Concept of quality control, elements of quality control, quality control groups, objectives of quality control, Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes, Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling. (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S (v) TQM system, concept & brief idea only

UNIT-II:WORK STUDY: Method study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, gang process chart, Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion Study. Principles of human motion economy, Micro-motion study, Memo motion study, Therbligs, left hand and right hand chart.

UNIT-III:CPM & PERT: Introduction to CPM, language of CPM net work. Diagram map for CPM chart, arrow diagram method of CPM, Programme Evaluation & Review Technique (PERT) Activity event net work (simple manual cases only), Project scheduling with CPM & PERT.

UNIT-IV:PLANT LAYOUT: General plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout, Advantages and disadvantages of process layout and product layout. GENERAL: Standardization, sources of standard, value of standardization, Production Planning & Control-Introduction, concept of planning, scheduling routing &dispatching and follow up functions. Need for Production, Planning and Control.

UNIT-V:MATERIAL HANDLING: Material Handling & material handling equipment, factors in material handling problems, cost reduction through improved material handling, Reduction in time of material handling, Material handling equipment-Idea about lifting lowering devices, Transportation devices, combination devices, Maintenance of material handling equipment.

INDUSTRIAL SAFETY: Need for safety-Legal, humanitarian, economic and social considerations. Safe working conditions and productivity, Unsafe conditions and hazards, Safety Engineering-General safety devices used on machines, Manual handling and storage of material, Mechanical handling of materials. Value Engineering, Meaning of Value, Value Analysis, reasons for unnecessary costs, selection of a product for value engineering, Data collection and analysis, TEN Commandments of Value Engineering, Brief idea of J.I.T. manufacturing and Kanban System.

Reference Books:

1. Industrial Safety, S.C. Sharma, Khanna Publishing House
2. Industrial Engineering Safety and Pollution ,Sanjai Kumar Gupta

CAD & CAM

UNIT-I:Introduction CIM and CAD & Analysis:
CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

UNIT-II:Computer aided Manufacturing CAM:
Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP : Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

UNIT-III: CNC Machine and Components:
CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

UNIT-IV:Part Programming:
NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

UNIT-V:FMS, Integrated Material Handling and Robot:
Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS).ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:
1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House
2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab & CAM Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.
10. To prepare part programming for plain turning operation.
11. To prepare part programming for turning operation in absolute mode.
12. To prepare part program in inch mode for plain turning operation.
13. To prepare part program for taper turning operation.
14. To prepare part program for turning operations using turning cycle.
15. To prepare part program for threading operation.
16. To prepare part program for slot milling operation.
17. To prepare part program for gear cutting operation.
18. To prepare part program for gear cutting using mill cycle.
19. To prepare part program for drilling operation

Design of Automotive Systems Lab

1. Design of automotive clutch assembly and component drawing using any drafting software (Two full imperial sheets along with design calculations report) consists of:
    - Functional design of clutch
    - Design of clutch shaft, hub and flange
    - Design of damper springs
    - Design of sectors, rivets etc.
    - Design of pressure plate assembly
    - Design for linkage mechanism
    - Details and assembly drawing
    - Details and assembly drawing
2. Design of automotive gear box along with reverse gear (Two full imperial sheets along with design calculations report) consists of:
    - Calculation of gear ratios
    - Determination of number of teeth on gear pair
    - Determination of gear reductions
    - Design of gear pairs
    - Design of shafts
    - Selection of bearings
    - Details and assembly drawing

3. Design of suspension spring and its analysis using any analysis software.

Level 7 (Semester II)

Vehicle Safety

UNIT-I: Introduction to vehicle safety, Basic concepts of vehicle safety, Risk evaluation and communication Human error control, Universal design, The distracted driver, Crash Testing

UNIT-II: Accident Data, Biomechanics and Occupant Simulation, Vehicle Body Testing, Dynamic Vehicle Simulation Tests, Occupant Protection, Pedestrian Protection, Compatibility, Interrelationship Among Occupants, Restraint Systems and Vehicle in Accidents, Significance of Rear Crash Safety, Role of seat in Rear crash safety, Performance criteria for different seats, Ultra high Retention seats

UNIT-III: Introduction to Accident Analysis Reconstruction methods, Uncertainty in Measurement and cautions Tire forces, Straight-line Motion, Critical speed from Tire Yaw marks, Reconstruction of Vehicular Rollover Accidents, Analysis of Collisions, Reconstruction Applications, Impulse Momentum Theory Crush Energy, Frontal Vehicle –Pedestrian Collision, Photogrammetry for accident constructions

UNIT-IV: Antilock braking system, Traction control system, Electronic Stability Program, Low tire pressure warning system, Collision avoidance systems

UNIT-V: Automotive Industry Standards, Transport Engineering Standards, Indian road congress Standards

Reference Books:

1. Automotive Vehicle Safety, Book by Barbara J. Peters and George A. Peters
2. Vehicle Safety Communications Book by Luca Delgrossi and Tao Zhang

Agile and Lean Manufacturing

UNIT-I:Introduction
Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

UNIT-II: Waste Identification
Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

UNIT-III:Value stream mapping
Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

UNIT-IV:Lean manufacturing tools
Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

UNIT-V:Agile manufacturing
Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:
1. Lean and Agile Manufacturing, Devadasan S.R
2. Agile and Lean Program Management, Johanna Rothman

Process Planning and Control

UNIT-I: Introduction, components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Selection of forecasting technique.

UNIT-II:Capacity Planning-
Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.

UNIT-III:Facility Location-
Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, Fixed position, combination and cellular layouts; Designing product and process layout, line balancing.

UNIT-IV:Production Control-
Capacity control and priority control, production control functions; Routing, scheduling, dispatching, expediting and follow up, Techniques of production control in job shop production, batch production and mass production systems

UNIT-V:Sequencing-
Priority rules, sequencing methods, sequence jobs through two work centers, scheduling services, application of CPM and PERT techniques.

Reference Books:
1.Process of Planning and Control, ChakrapaniSrinivasa

Project

On the basis of learning in the Bachelor of Vocational, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Automobile Servicing(AS)
Branch Code:102

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Automobile Servicing

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BASV511	Motor Vehicle Technology -I	30	10	5	5	20	30		**50**	**2**
2	BASV512	Manufacturing Technology	30	10	5	5	20	30		**50**	**2**
3	BASV513	Automobile Electrical Equipment	30	10	5	5	20	30		**50**	**2**
4	BASV514	Two and Three Wheeler	30	10	5	5	20	30		**50**	**2**
5	BASP511	Mechanical Workshop Practice lab	30				20		30	**50**	**1**
6	BASP512	Basic Electricity and Electronics lab	30				20		30	**50**	**1**
7	BASP513	Language Lab	30				20		30	**50**	**2**
8	BAST511	Automotive Service Technician Level 5 (ASC/Q 1403)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BAST512	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAST513	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAST514	Equipment Designer L5 (ASC/Q 6405)									
	BAST515	Tool Designer (ASC/Q4001)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BASV521	Modern Electric & Hybrid Vehicles	30	10	5	5	20	30		**50**	**2**
2	BASV522	Motor Vehicle Technology -II	30	10	5	5	20	30		**50**	**2**
3	BASV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BASV524	Garage Organization & Transport Management	30	10	5	5	20	30		**50**	**2**
5	BASV525	Project	30				20		30	**50**	**1**
6	BASP521	Electric & Hybrid Vehicles Lab	30				20		30	**50**	**1**
7	BASP522	IT Tool Lab	30				20		30	**50**	**2**
8	BASP523	Equipment Designer L5 (ASC/Q 6405)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BAST521	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAST522	Industrial Engineer (Layout Design) (ASC/Q6401)									
	BAST523	Automotive Service Technician Level 5 (ASC/Q 1403)									
	BAST524	Tool Designer (ASC/Q4001)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV631	Automobile Electrical System	30	10	5	5	20	30		50	2
2	BASV632	Automobile Drawing & Design	30	10	5	5	20	30		50	2
3	BASV633	Automobile Engine Systems	30	10	5	5	20	30		50	2
4	BASV634	Auto Body Repair, Denting & Painting	30	10	5	5	20	30		50	2
5	BASH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BASP631	Automobile Workshop - I	30				20		30	50	1
7	BASP632	Auto Body Repair, Denting & Painting Workshop	30				20		30	50	1
8	BAST631	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training 400 hrs/ 8 weeks			150	12
	BAST632	Automation Specialist (ASC/Q6807)									
	BAST633	Assembly Line Machine Setter (ASC/Q3603)									
	BAST634	Process Design Engineer (ASC/Q6404)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV641	Automobile Engine Systems	30	10	5	5	20	30		50	2
2	BASV642	Automotive Refrigeration and Air Conditioning	30	10	5	5	20	30		50	2
3	BASV643	Vehicle Performance and Testing	30	10	5	5	20	30		50	2
4	BASV644	Electric and Hybrid Vehicles-II	30	10	5	5	20	30		50	2
5	BASH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BASP641	Automotive RAC Lab	30				20		30	50	1
7	BASP642	Vehicle Performance and Testing Lab	30				20		30	50	1
8	BAST641	Quality Controller (ASC/Q1605)					Any one Training (other than 3rd sem) 400 hrs/ 8 weeks			150	12
	BAST642	Automation Specialist (ASC/Q6807)									
	BAST643	Assembly Line Machine Setter (ASC/Q3603)									
	BAST644	Process Design Engineer (ASC/Q6404)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV751	Automotive System Design	30	10	5	5	20	30		50	2
2	BASV752	Alternative Fuel & Emission Control	30	10	5	5	20	30		50	2
3	BASV753	Automobile Maintenance Service &Repairs -I	30	10	5	5	20	30		50	2
4	BASV754	Auto NVH	30	10	5	5	20	30		50	2
5	BASH755	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BASP751	Automobile Workshop - II	30				20		30	50	1
7	BASP752	Design of Automotive Systems Lab	30				20		30	50	1
8	BAST751	Spare Parts Operations In charge (ASC/Q1503)					Any one Training 400 hrs/ 8 weeks			150	12
	BAST752	Body Shop In-Charge (ASC/Q1413)									
	BAST753	Service Supervisor (ASC/Q1412)									
	BAST754	Testing Manager (ASC/Q8405)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BASV761	Automobile Maintenance Service & Repairs - II	30	10	5	5	20	30		50	2
2	BASV762	Off-road Vehicles	30	10	5	5	20	30		50	2
3	BASH763	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BASP761	Automobile Workshop - I	180						150	150	6
5	BAST761	Product Design Manager L7 (ASC/Q8103)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BAST762	Body Shop In-Charge (ASC/Q1413)									
	BAST763	Service Supervisor (ASC/Q1412)									
	BAST764	Testing Manager (ASC/Q8405)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Motor Vehicle Technology – 1

Unit1: Introduction & Chassis Layout

General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle, their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

Unit2: Clutch System

Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque transmitted by clutch. Simple numerical problems. Clutch defects, probable causes, remedies.

Unit3: Gear Box

Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheel drive auxiliary gear box. Gear ratio

Unit4: Final Drive

Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio. Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

Unit5: Wheels and Tyres

Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyre pressure, Advantages of filling nitrogen in tyres.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology.A.W Hillier

Manufacturing Technology

UNIT1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Riveting, Elementary idea of machines used for the above processes.

UNIT2

WELDING:
(a) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.
(b) Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding and Gas welding (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG) (vi) Tungsten Inert Gas welding (TIG)

WELDING OF SPECIAL MATERIALS: (a) Welding of carbon steel, Low alloy steel and stainless steel, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron (c) Welding of Aluminium (d) Welding of Plastics.

UNIT 3

Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools-Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools
PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.
Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

UNIT4
Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects
MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces,

their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

FOUNDRY PRACTICE: Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

UNIT5

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods-Tensile Test, Hardness Test, Fracture Test, Impact Test (b) Non destructive methods-visual, Liquid Penetrant Testing, Magnetic particles Testing, Radiographic Testing.

Advance Welding Process: Plasma Arc Welding, Laser Beam Welding, Electron Beam welding, Atomic Hydrogen arc welding, Stud welding, Explosion welding.

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi

2. Production Technology, Vol. I: Hazra&Chaudhry

Automobile Electrical Equipment

Unit 1: Automobile Wiring Systems & Cables

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems Positive and negative earthing. Cables-starting systems cables, general purpose cables and hightension cables; specifications and colour codes. Diagram of a typical wiring systemWiring harness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits Fuses in circuits.

Unit 2: Storage Battery

Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound. Electrolyte: specific gravity of electrolyte and its variation with temperature. Effect of charging and discharging of specific gravity, Capacity of battery Efficiency of battery, Methods of charging of battery, Internal circuit of battery charger, Care and maintenance of batteries, Checking for cell voltage and specific gravity of electrolyte, Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test, Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery, Alkaline type batteries, Fuel cell and its types, Battery Life enhancer.

UNIT 3: Dynamo

Principle of generation of D.C. Constructional details of a Dynamo, Armature reaction, Principle of commutation, Construction of commutator. Types of wound field generator series, shunt and compound wound, Other types of D.C. generators-four brush & four pole, interlope, split field and bucking field, Dyna-Starter, Generator drive.

UNIT 4: Alternator

Principle of generation of A.C. Constructional details of an alternator, Working of alternators Advantages over dynamo, Types of alternators, Charging of battery with an alternator, Regulator for alternators.

UNIT 5: Regulators

Constant current and constant voltage systems, Double-contact and compensated voltage control regulators. Current-and-voltage regulator, Cut-out

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge
4. Automotive Electrical Equipment: WH Crouse

Two and Three Wheeler

Unit I: The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

Unit II: Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, and starting system - Kick starter system – Self starter system, recent technologies

Unit III: Chassis and Sub-Systems

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems, Shock absorbers, Panel meters and controls on handle bar, Freewheeling devices

Unit IV: Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links layouts. Brake actuation mechanism. Spoked wheel, cast wheel, Disc wheel & its merits and demerits. Tyres and tubes Construction & its Types. Steering geometry

Unit V: Two & Three Wheelers – Case Study

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer, Servicing and maintenance, recent developments.

Reference Books:

Two and three wheeler technology, dhruv u. Panchal

Mechanical Workshop Practice Lab

1. SHEET METAL WORKING AND SOLDERING:

(EX-1) Cutting, shearing and bending of sheet.
(EX-2) To prepare a soap case by the metal sheet
(EX-3) To make a funnel with thin sheet and to solder the seam of the same
(EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:

(EX-1) Hack sawing and chipping of M.S. flat
(EX-2) Filing and squaring of chipped M.S. job
(EX-3) Filing on square of rectangular M.S. Plate

3. SMITHY SHOP WORK:

(EX-1) To prepare square angular piece by M.S. rod
(EX-2) To Braze M.S. flat/Tipped tool on M.S. shank
(EX-3) To make a screw driver with metallic handle

4. Tin Smithy, Soldering, Brazing

(EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
(EX-2) Utility article-waste paper basket or paper tray
(EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:

(EX-1) Welding practice gas & electric
(EX-2) Welding for lap joint after preparing the edge
(EX-3) Welding Butt joint after preparing the edge
(EX-4) Gas Cutting
(EX-5)'T' joint welding after preparation of edge.

6. Measurement of angle with the help of sin bar /Vernier Bevel protractor
7. To measure the pitch, angle and form of thread of screw.
8. To measure length, breadth, Thickness and depth height with micrometer height gauge and Vernier Calipers.
9. Calibration of Vernier Calipers/micrometersHeight gauge/depth gauge.
10. Use of feeler, wire radius and fillet gauge measurement of standard parameters.

Reference Books:

1. Workshop Technology, Vol. I: Hazra&Chaudhry
2. Elements of workshop Technology Vol. I: BS Raghuwanshi

Basic Electricity & Electronics - Lab

1. Study of series resistive circuits.
2. Study of parallel resistive circuits.
3. Study of series and parallel connection of cells in circuits.
4. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
5. Charging and Discharging of a capacitor.
6. Verification of magnetic field of solenoid with Iron core and Air core.
7. Verification of Torque development in a current carrying coil in magnetic field.
8. Study of R.L.C. series circuit and measurement of power and power factor.
9. Study of current and voltage measurement using Ammeter and Voltmeter.
10. Study of current and voltage measurement using Galvanometer.
11. Study of current, voltage and resistance measurement using of Multi-meter
12. Study of Power and Energy measurement using Wattmeter and Energy meter.
13. Study of working of single layer PCB manufacturing.
14. Study of working of double layer PCB manufacturing.
15. Study and interpreting circuit diagram and to check the continuity of connections.

Instrument Required:

1. Trainer kit for measuring TCR
2. Lead acid battery
3. Hydrometer
4. Trainer kit for measuring power and power factor in RLC circuits
5. Ammeter
6. Voltmeter
7. Multi-meter
8. Galvanometer
9. Energy Meter
10. PCB Manufacturing Facility

Level 5 (Semester II)
Modern Electric and Hybrid Vehicles

Unit 1:

Introduction
Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics

Unit 2:

Electric and Hybrid Electric Drive Trains
Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages and disadvantages

Unit 3:

Power Flow
Power flow control in electric and hybrid electric drive train topologies.

Unit4:

Electric Drive Components
Introduction to electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.

Unit 5:

Regenerative Braking System (RBS)
Introduction and need of Regenerative Braking System, Advantages and disadvantages of RBS, Working of RBS, Concept of Regenerative Braking using Piezoelectric material, Using shock absorbers as vibration energy harvesters.

Reference Books:
1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Automotive Fuel Technology-Electric, Hybrid and Fuel-Cell Vehicles: Jack Erjavec& Jeff Arias
3. Electric and Hybrid Vehicles: Design Fundamentals: Iqbal Husain
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design: Mehrdadehsani, Yimingao, AliEmadi

Motor Vehicle Technology - II

Unit 1:

Frame and Body

Function and construction of frame, Cross-section of frames, Unitized construction (monocoque) types of bodies, Terms - Turning radius, lock-to-lock angle, centre point steering, positive steering, grade ability, Idea of Safety features in a modern car.

Unit 2:

Suspension System

Function, Types - conventional and independent, Spring types - coil, leaf - elliptical, semielliptical; helper springs, transverse springs, Spring camber; spring material, Torsion bar, stabiliser bar, Shock absorbers- telescopic and gas, Maruti suspension system and shockers.Anti-roll bars, Nitrox suspension.

Unit 3:

Steering System And Front Axle

Principle - Ackermann and Davis, Function, requirements, Steering gear box – types, Construction and working details of worm and sector, rack and pinion, worm and wheel, worm and recirculating ball type.Tractor steering, Power steering, Electronic Steering, Front axle - rigid front axle, Stub axle, Elliot and reverse elliot type, Lemoine and reverse lemoine type, Tractor front axle, Maruti steering system.Wheel alignment - castor angle, camber angle, K.P.I., Toe-in, toe out.General values ofthese.

Unit 4:

Braking System

Braking terms - braking efficiency, stopping distance, stopping time, weight transfer during braking, leading/trailing shoe of brake.Determination of braking torque, Effect of braking on steering, Types of braking systems- constructional details and working of mechanical brakes, hydraulic brakes, parking brake, vacuum, pneumatic, air-hydraulic brakes; tractor brakes, Drum and disc brakes, Master cylinder, tandem master cylinder, wheel cylinder, Brake lining and brake fluid, Brake defects, their causes and remedies, Anti Lock Braking System (ABS) & Electronic Brake Distribution (EBD).

Unit 5:

Automobile Pollution And Its Control

Effects and extent of pollution caused due to stationary and automobile engines, Harmful products and their causes in petrol & diesel engines, Measures to control exhaust emissions from two-stroke engines, four-stroke engines, and diesel engines, Turbocharger, Products which cause de-activation of catalysts in catalytic converters, Unleaded petrol, Emission measuring instruments for petrol and diesel engines. Limits specified in Motor Vehicles Act. Recent trends in Automobile Pollution Control-Exhaust Gas Recirculation, Air Injection, Reactor System, Positive Crankcase Ventilation, Evaporative Emission Control System.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House
2. Hillier's Fundamentals of Motor Vehicle Technology.A.W Hillier

Material Science & Materials

Unit 1 General:

Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importance, Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

Structure of Metals and their Deformation:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

Unit 2

Metals-Ferrous Metals

(a) Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications

(d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

UNIT 3:

NON-METALIC MATERIALS

Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

UNIT 4

Identification and Testing of Metal Alloys:

Selection, specification forms and availability of materials.

Heat Treatment of Metals:

Elementary concept, purpose, Iron-carbon equilibrium diagram, T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:

1. MATERIAL SCIENCE: RS Khurmi& RS Shedha
2. Material Science and engineering V Raghavan

Garage Organization & Transport Management

Unit 1:

Layout of garage and tools & equipment required

Location of modern automobile garage, Layout of a fully equipped modern garage, Major equipment used in repair, testing, and reconditioning of automobiles, Service Station equipment (compressor, washer, hydraulic ramp and other lifting devices etc.)Denting and painting tools and equipment, Layout of fuel filling station-cum-service station.Workshop safety.

Unit 2:

Garage Procedure

A typical garage organisation chart, Duties of garage foreman, Vehicle selling- dealership, showroom, Terms of Warranty, after-sales service, advertising, and salesmanship. Diagnosing and estimating repairs. Booking of repairs, Job card, time card, Inspection and testing of repaired vehicles, Billing of repairs, Customer record, Purchase and sale of used vehicles, Insurance and accidental jobs.Safety in garages.Customersatisfaction.Time management.

Unit 3:

Store Organisation

Stores and store-keeping procedure.Day book, ledger, stock register.Indenting and issue of spares and materials.Inventorycontrol.Stocking of material - shelves, racks, bins; fuels and inflammable materials.Handling of liquids and acids.Duties and responsibilities of storekeeper and purchase officer.Tools-Storing and issuing.

Unit 4:

Fleet Management

Types of vehicles in a fleet - goods vehicles, tankers and carriers, delivery vans, fire fighting vehicles, break-down service vehicles, buses and luxury vehicles. Layout of a fleet maintenance depot, Duties of driver, conductor and mechanic, Scheduling the maintenance of a fleet. Estimating the operating cost of transport vehicles

Unit 5:

Motor Vehicle Act

Definition of vehicles, testing and certifying procedures, Registration of vehicles, Permits for passenger and goods vehicles, Licensing, Transfer of ownership. Essentials of driving and traffic regulations; signals and traffic signs

Reference Books:

1. Fleet Maintenance & Management: AW Clair
2. Motor Vehicle Act and Transport Management V.S.Khilery

Project

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Electric and Hybrid Vehicles Lab

1. Understand working of different configurations of electric vehicles
2. Understand hybrid vehicle configuration and its components, performance analysis
3. Understand the properties of batteries and its types
4. Understand of electric vehicle drive systems.
5. Understand of hybrid electric vehicles.
6. Understand Auxiliary systems including charging, starter motor, on board power supply, lighting and environmental sensing and conducting repairs. Repair & Replacement of Electric/ Hybrid Vehicle body
7. Repair & Replacement of Electric Vehicle Drive Train 8. Fault diagnosis & repair / replacement of Battery, DC & AC Electrical Machines, Hybrid Electric Vehicles.

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 6 (SEMESTER- III)

Automobile Electrical System

UNIT 1:

Starting System

Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, typical motor specifications

UNIT 2:

Ignition System Of Spark-Ignited Engines

Types of ignition systems- battery-and-coil, magneto ignition systems, Ignition circuit, Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive. Firing order, Ignition timing. Ignition advance and retard, need, and factors it depends upon, Methods for obtaining advance and retard-vacuum and mechanical, Optical sensor for spark timing.

UNIT 3

Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs, Glow plugs of diesel engines.Magneto-rotating armature and rotating magnet types, Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

UNIT 4:

Lighting System

Requirements of automobile lighting, Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly, Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners.Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs.Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp. Auxillary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

UNIT 5:

Accessories

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, amperemeter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly, Radio and television Interference suppressors, electrical switches. Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge
4. Automotive Electrical Equipment: WH Crouse

Automobile Drawing & Design

Unit 1

Drafting of sectional views of the following assemblies: (a) Cylinder block and crankcase of 2-wheeler, (b) Poppet valve assembly of a 4-stroke engine, (c) Piston assembly, (d) Connecting rod assembly, (e) Spark plug, (f) Injector.

Unit 2

Free hand line diagram of the following systems: (a) Fuel system of petrol engine (b) Fuel system of diesel engine (c) Cooling system of a multi-cylinder engine (d) Lubricating system of a multi-cylinder engine (e) Steering system of Maruti (f) Suspension systems of Maruti (g) Hydraulic Braking System of Maruti Zen (h) Air Hydraulic Braking System of TATA (i) Block diagram of Electronic Fuel Injection (EFI) system (j) Block diagram of Common Rail Direct Injection (CRDI) system (k) Oxygen sensor (l) Fuel injector of EFI.

Unit 3

Drafting of sectional views of the following assemblies

(1) Master cylinder (2) Wheel cylinder (3) Universal joint

Unit 4

Sketch layouts of (a) Depot (b) F.I. pump reconditioning shop (c) Electrical Workshop.

Unit 5

Design of the following components of an automobile engine

(1) Piston assembly (2) Connecting rod assembly (3) Crank shaft (4) Flywheel

Reference Books:

Automobile Drawing: RB Gupta

Automobile Engine System

UNIT1

(A) Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat, Conservation of energy. First and Second Law of thermodynamics P-V diagram Reversible process Various thermodynamic processes, Entropy, General case for change of entropy of a gas. Change of entropy during various processes, Temperature-entropy diagram,Simple numerical problem

(B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle, Effect of compression ratio on efficiency, Simple numerical problems, Graphical representation of ideal and actual cycle, Comparison between actual and ideal cycles, Reasons for variation. Mean effective pressure, Work done during the cycle.

UNIT2

(A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams, Classification of I.C. Engines.

(B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, gaskets, Different cylinder arrangements. Cylinder wear, Forms of combustion chamber in petrol engine Location of spark plug Combustion chamber in Diesel engines, Turbulence in Combustion chambers.

UNIT3:

Engines Details (CONTINUED)

(b) Piston-plain, split skirt, auto-thermic, cam-ground, Anodising and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism, Valve clearance Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod Bearing metal for big and small end of connecting rod (g) Crank shaft, Left hand, right hand crankshaft, Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding).Main bearings, Crankshaft end play, Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT).

UNIT4

(A) Rotary Engine. Principle and operation, Engine cooling, Advantages and limitations.

(B) Internal combustion Turbines. Principle of working, Classification,Brayton cycle, Cycle efficiency, Friction effect, Optimum compression ratio, Simple numerical problems, Deviation of practical cycles, Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials, Turbine blades.

UNIT5

(A) Supercharging and scavenging. Necessity of supercharging, Rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging, Methods and classification of scavenging process, Performance of different scavenging systems.
(B) Engine specifications, specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Thermal Engineering I & II: Sarao, Gambhir&Aggarwal
3. Automobile Engineering II: Kirpal Singh
4. Basic Automobile Engineering: CP Nakra
5. Automobile Engineering: RB Gupta

Auto Body Repair, Denting & Painting

Safety precautions and first aid, Proper use, care and maintenance of tools and equipments Introduction on types, function of body and panels, Procedure for inspection, removing and refitting of body components panels, doors and other body parts, Arc welding-basic electricity and welding power source. Electrodes types, description and specification.arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting, Resistance welding-resistance welding, process-spot, seam and butt welding Details of MIG welding, Method of fixation of wind screen, glass Procedure for cut open, beat out, dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application &primer application at different stages of affected area(chronological order for repair of auto body)fitment of repaired part and aligning to the original shape Personal safety – three key areas of risk eyes, skin and inhalation Details of personal protective, equipments-RPE,PPE Details of ingredients of paint, Procedure of refinishing process, Selection of consumable for doing painting work Procedure for doing painting(in chronological order),selection of materials, tools and equipments application of body filler for surface preparation, sanding on the affected area for smooth surface preparation, primer coating on the affected area, preparing affected surfaces for base coating, applying Base coat painting, clear coat painting for metallic paints, rubbing and polishing,
Application of paint production, treatment/anti rust treatment Procedure for inspection of painting, work and fixing the wind screen glass Details of spray gun-types-standard air, gap design-different sizes of nozzles, Details of different types sanding - 15 equipments Different types of sand paper-grades, Possible defects in painting, objects, causes and its cure.

Reference Books:
Automotive Body Repair & Painting Manual, John Harold Haynes

Automobile Workshop -I

UNIT 1

Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, WagonR, Swift (Petrol & Diesel); Hyundai: Santro, Ford: Figo; Volkswagen: Polo; Chevrolet: Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking

UNIT 2

Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerised wheel aligner

UNIT 3

Measurement of Exhaust Pollution by various analysers such as Four Gas Analyser, Smoke meter, Noxanalyser

UNIT 4

Use of Headlight aligner, Wheel aligner, automotive oscilloscope

UNIT 5

Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focussing and alignment of head lights

Reference Books:

1. Engine Service: Gary Lewis
2. Various Car's Manuals

Auto Body Repair, Denting & Painting Workshop

AUTO BODY REPAIR Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety Simple basic practices on computer reading, service manuals, collision repair manuals and colour matching guide, Identification of different types of body, chassis and drive lines, Identification of location of parts and panels, Practice on operating the air compressor, Practice on periodical maintenance of air compressor Inspect and decide whether it can be repaired or replaced Remove and refit body panels, doors, floors, wheel boxes and fenders Practice on removing and refitting wind shield glasses Practice on arc welding on vehicle body Practice on gas welding, gas brazing, gas soldering and gas cutting on vehicle body Practice on resistance, spot, seam and butt welding on vehicle body Practice on MIG welding Safety precautions and first aid. Proper use, care and maintenance of tools and equipments, Introduction on types, function of body and panels Procedure for inspection, removing and refitting of body components panels, doors and other body parts Arc welding-basic electricity and welding power source. Electrodes types, description and specification, Arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting Resistance welding-resistance welding process-spot, seam and butt welding Details of MIG welding Method of fixation of wind screen glass Procedure for cut open, beat out dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application &primer application at different stages of affected area(chronological order for repair of auto body)fitment of repaired part and aligning to the original shape, Practice on plasma welding, Practice on minor repair of auto bodycut open, beat out, strip out old paint, make smooth surface by using different grades of sanders, apply putty on affected area and applying primer(repair damaged body which is ready for final paint) Apply base coat painting, Fit check the repaired components for alignment

AUTO BODY PAINTING Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety, Practice on removing paint from the damaged area Practice on mixing and applying body filler Practice on sanding(block) Practice on mixing and applying putty Practice on applying primer Practice on feather edge sanding and masking Base coat application Surface cleaning and degreasing Second and third coat application Preheating the vehicle and cooling Cutting, scuffing, rubbing and polishing

Reference Books:

Automotive Body Repair & Painting Manual, John Harold Haynes

Level 6 (Semester IV)
Automobile Engine Systems

UNIT 1

STARTING SYSTEM: Idea of engine starting-system circuitKick-starting system of 2 wheelers Starting of mopeds.

IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and its working, Compression ignition of diesel engines.

LUBRICATION SYSTEM: Lubrication in 2 stroke engines - petroil and oil-injection, Lubrication in 4 stroke multi-cylinder petrol/diesel engines, Dry and wet sump lubrication, Full pressure and semi-pressure lubrication Oil pump types, Oil pump drive, relief valve; pressure gauge. Oil filters. Full-flow and by-pass type filtering systems, Crankcase dilution, crankcase ventilation Positive Crankcase Ventilation.

Properties and functions of a good lubricating oil, Additives, Gradation of lubricating oil due to viscosity.SAE numbers, Service rating, 2T and Super 2T oils for use in 2-s engines.

UNIT 2

COOLING SYSTEM: Necessity of cooling of I.C. engines, Methods of cooling-air cooling, water cooling, liquid cooling, Shape of cooling fins Field of application of air cooling.

Water cooling system - Thermo siphon system, pump system, thermostat system of cooling Thermostat - types Radiators-different types, their construction and function Pressurized cooling system; radiator pressure-cap, surge tank Cooling water temperature gauge Anti-freeze and anti-corrosive additives Coolants Flushing of cooling system.

AUTOMOBILE ENGINE FUELS: Types of fuels. Influence of structure. Calorific value Requirements in fuels for I.C. engines Properties Fuel rating, Additives for S.I. and C.I. engine fuels, Specifications of petrol and diesel Leaded and un-leaded petrol, Low Sulphur diesel Enhancing Power output- Nitrox injection.

Non-conventional fuels - LPG, CNG ethanol-mixed petrol, Properties, method of manufacture and their performance as I.C. engine fuels, Engine modifications required, Dual mode engine,
Idea of Electric Vehicles and Hybrid Vehicles.

UNIT 3

FUEL SYSTEM OF DIESEL ENGINES: Fuel supply system, Filters (primary and secondary); positioning of filters, Feed pump Solid and air injection system Fuel injection pump, different types- plunger, distributor pump, their construction and working, Injectors Governors Types of governing Combustion process in diesel engine, Diesel knock, Electronically Controlled Diesel Injection Pump Common Rail Direct Injection Piezoelectric effect and its use in CRDI.

UNIT 4

FUEL SYSTEM OF PETROL ENGINES: Gravity feed system used in 2-wheelers, Fuel supply circuit of 4-wheelers.Mechanical and electrical fuel pump, Electric fuel gauge, Petrol fuel filter, Air/fuel ratio, Variation of air/fuel ratio with speed, Air cleaners (wet & dry).Cyclone filter.

CARBURETOR - Function and principle of working of simple carburetor. Carburetor controls- throttle, choke. Types of Carburetors- fixed jet carburetor (Solex type) and constant vacuum carburetors used

in YAMAHA motorcycle, Twin-barrel carburetors, Classification of carburetors, Disadvantages of carburetors Phenomenon of combustion and detonation Pre-ignition.

UNIT 5

FUEL INJECTION SYSTEMS (PETROL ENGINE): TBI, MPI; the Electronic Module, Advantages of Electronic Fuel Injection (EFI). Block diagram of the EFI, The Air Intake System and the Idle Air Control System. Fuel Delivery System. Various sensors used with the ECM, their location and purpose. Fuel Injector, Idea of Gasoline Direct Injection ENGINE PERFORMANCE AND TESTING: Various losses in an engine. Heat balance, Morse method of finding IHP, Calculation of various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, specific fuel consumption. Performance curves.

Reference Books:

Automotive Engines, A.K. Babu, Khanna Publishing House

Automotive Refrigeration & Air-conditioning

Unit-I: Refrigeration Fundamentals: Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air conditioning.

Unit-II: Refrigerants and Air Conditioning Components: Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination

Unit-III: Air distribution system: Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance

Psychrometry: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.

Unit-IV: Load analysis and control devices: Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and actuators.

Unit-V: Diagnostics, Trouble Shooting, Service and Repair: Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass. Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting. Removing and replacing components, Compressor service.

Reference Books:

Refrigeration & Air Conditioning, Sadhu Singh, Khanna Publishing House

Vehicle Performance & Testing

Unit-I: Vehicle Performance Parameters: Vehicle Performance parameters: Fuel economy, acceleration, deceleration, gradability, top speed, handling, comfort, life durability, EGR systems, Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function andconstruction, Lambda close loop control system for gasoline vehicles.

Unit-II: Drive train and Component testing: Vehicular transmission performance: comparison of automotive clutches,Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.

Unit-III: Vehicle testing: Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle.

Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water

Laboratory testing:Testing on chassis dynamometer, transition testing (Euro III onwards), accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test.

Collisions and Crash Testing:Crash testing: Human testing, dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.

Unit-IV: Comfort, Convenience and Safety: Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system, Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.

Unit-V: Noise Vibration and EMI: Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement. Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.

Reference Books:

Road Vehicle Performance: Methods of Measurement and Calculation, George Gordon Lucas

Electrical & Hybrid Vehicles – II

Unit -I: Hybrid Architecture and Power Plant Specifications: Series configuration locomotive drives- series parallel switching- load tracking architecture. Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT)- wheel motors. Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.

Unit -II: Sizing the Drive System and Energy Storage Technology: Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters

Unit-III: Fuel Cells: Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra capacitors- PEM fuel cell vehicles.

Unit IV: Energy Storage: Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel-Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.

Unit -V: Nonelectric Hybrid Systems: Short term storage systems flywheel accumulators, continuously variable transmissions hydraulic accumulators hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.

Reference Books:

1. Electric & Hybrid Vehicles, A.K.Babu, Khanna Publishing House
2. Impacting Rapid Hydrogen Fuel Cell Electric Vehicle Commercialization David.L. Wood

Automotive RAC Lab.

1. Test on vapor compression test rig.
2. Test on air conditioning test rig.
3. Study of various methods of transport refrigeration systems.
4. Study and demonstration on car and bus air conditioning system.
5. Study of latest trends in automotive refrigeration systems.
6. Study and demonstration of controls in refrigeration.
7. Study of different components with the help of cut sections/models/charts- Compressor, Condenser, Evaporators, Expansion device, Blower fans, Hating systems etc.
8. Study of installation/operations/maintenance practices for refrigeration systems.
9. Study of leak testing and leak detection methods.
10. Visit to maintenance shop of automotive air conditioning and writing report on it.

Vehicle Performance & Testing Lab

1. Estimation of power requirement for vehicle propulsion by taking actual vehicle example.
2. Perform coast down test to find vehicle inertia.
3. On road fuel consumption test at different speeds.
4. Brake efficiency measurement
5. Pass- by noise test.
6. Free acceleration test.

7. Vibration measurement in passenger compartment
8. Laboratory testing of vehicle on chassis dynamometer for performance
9. Laboratory testing of vehicle on chassis dynamometer for emission.
10. Report based on visit to vehicle testing and research organization.
11. On road emission testing of petrol and diesel vehicles for PUC/RTO.

Level 7 (Semester V)

Automotive System Design

Unit-I:

Design of Clutches & Gearbox:

Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch. Selection of gear ratios and final drive ratio, numerical on 3- speed and 4- speed gearbox.

Unit-II:

Design of Propeller Shafts and Axles:

Design of propeller shafts for bending, torsion and rigidity, Design of universal joints and slip joints, final drive, Design of live and dead axles.

Unit-III:

Brake Systems:

Design of hydraulic braking system, internal expanding shoe brake and disc brake, design of master and wheel cylinder and piping design.

Unit-IV:

Design of Suspension and Steering System:

General design considerations of suspension system, design of helical and leaf springs for automobile suspension system, design considerations of belleville springs, elastomeric springs, design considerations of steering system and vehicle frame design.

Unit-V:

Statistical Consideration in Design and Optimization:

Ergonomics and aesthetic design, statistics in design, design for natural tolerances, statistical analysis, and mechanical reliability, introduction to design optimization of mechanical elements, adequate and optimum design, methods of optimization, johnson's method of optimum design-simple problems in optimum design like axially loaded members.

Reference Books:

1. Automotive Systems Engineering, Hermann Winner, Markus Maurer
2. Automotive Mechanics – SIEWilliam Crouse

Alternative Fuel and Emission Control

Unit-I: Conventional Fuels and Need for alternative fuels: Estimate of petroleum reserve and availability - comparative properties of fuels- diesel and gasoline, quality rating of SI and CI engine fuels, fuel additives for SI and CI engines, thermodynamics of fuel combustion - introduction to chemical thermodynamics, chemical reaction - fuels and combustion, enthalpy of formation and enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, need for alternative fuels, applications, types etc.

Unit-II: Alternative Fuels: Gaseous Fuels and Bio-fuel: Introduction to CNG, LPG, ethanol, vegetable oils, bio-diesel, biogas, Hydrogen and HCNG. Study of availability, manufacture, properties, storage, handling and dispensing, safety aspects, engine/vehicle modifications required and effects of design parameters performance and durability

Synthetic Fuels Introduction to Syngas, DME, P-Series, GTL, BTL, study of production, advantages, disadvantages, need, types, properties, storage and handling, dispensing and safety, discussion on air and water vehicles.

Unit–III: Emission Control (SI Engine): Emission formation in S.I. engines - Hydrocarbons, carbon monoxide, oxides of nitrogen, poly-nuclear aromatic hydrocarbon, effects of design and operating variables on emission formation in spark ignition engines, controlling of pollutant formation in engines exhaust after treatment, charcoal canister control for evaporative emission control, emissions and drivability, positive crank case ventilation system for ubhc emission reduction.

Unit-IV: Emission Measurement and Control (CI Engine): Chemical delay, intermediate compound formation, pollutant formation on incomplete combustion, effect of design and operating variables on pollutant formation, controlling of emissions, emissions and drivability, exhaust gas recirculation, exhaust after treatment – doc, dpf, scr and lnt. Measurement and test procedure (ndir analyzers, fid, chemiluminescencenox analyzer, oxygen analyzer, smoke measurement, constant volume sampling, particulate emission measurement, orsat apparatus.)

Unit-V: Health effects of Emissions from Automobiles: Emission effects on health and environment. Emission inventory, ambient air quality monitoring, Emission Norms: As per Bharat Standard up to BS– IV.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Engine Emissions: Pollutant Formation and Advances in Control TechnologyB.P. Pundir

Automobile Maintenance Service & Repairs – I

Unit 1:

Workshop Equipment

Equipment for testing electrical accessories: Electric test bench, growler, coil tester, ignition and cam-dwell-angle tester; wiring harness tester. Ampere-hour battery tester, voltmeter tester, Layout of diesel injector and F.I.P. reconditioning shop, Tools and equipment required

Unit 2:
Lubrication and Maintenance Schedule

Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles

(a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential (g) Axles and hubs

Unit 3:
Lubrication and Maintenance Schedule

(a) Suspension system (b) Steering system (c) Tyre (d) Chassis (e) Brake-drum and disc

(f) Battery (g) Self starter (h) Dynamo

Unit 4:
Fuel System

Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipe lines, priming unit, tanks. Electricals: Maintenance Schedule of batteries, starter motor, dynamo, ignition system, wiper motor, electrical fuel pump, alternator, horn, flasher unit.

Unit 5:
Engine Tuning

(a) Engine tuning of conventional and MPFI petrol engine. Adjustments of spark plug gap, valve tappet clearance, head bolts, Use of vacuum and compression gauge, Air cleaner cleaning, Ignition timing setting by timing light, Pollution checking, Troubleshooting

Reference Books:
Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

Automotive NVH

Unit-I:

Introduction to NVH and Vibrations:
Noise Vibration and Harshness (NVH) and its role in automotive design and development. Physiological effects of noise and vibration, sources of vibration and noise in automobiles, Basic concepts of vibration, time period, frequency, SHM, types of vibration, Natural frequency, resonance, damping, mathematical models.

Unit-II

Vibration Control and Measurement:
Different types of dampers, vibration absorbers, centrifugal pendulum, dry friction, untuned viscous, vibration isolation, Instruments, vibrometer, velocity pick-ups, frequencymeasurement instrument.one applications: isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft.

Unit-III:

Noise Fundamentals:
Fundamentals of acoustics–general sound propagation–structure borne sound and air borne sound, plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity, spherical wave propagation – acoustic near and far fields, reference quantities, the decibel scale

Unit-IV:

Sound Analysis:
Anatomy of human ear, mechanism of hearing, loudness, weighting networks, equivalent sound level, relationship among sound power, sound intensity and sound pressure level.

Unit V:

Automotive Noise Sources and Control Techniques
Methods for control of engine noise, transmission noise, intake and exhaust noise, aerodynamic noise, tyre noise, brake noise.
Noise control strategy, noise control at source – along the path isolation, damping, balancing, resonators, absorption, barriers and enclosures.

Reference Books:
1.Automotive NVH Technology (SpringerBriefs in Applied Sciences and Technology),**Fuchs**, Anton, **Nijman**, Eugenius, **Priebsch**, Hans-Herwig (Eds.)

Automobile Workshop - II

1. Find the mechanical efficiency of a multi-cylinder engine by Morse Test
2. Tune a multi-cylinder petrol engine and set dwell, rpm, ignition timing, CB point gap, spark plug gap, and tappet clearance.
3. Check the condition of the given battery as regards: (i) cell voltage (ii) specific gravity (iii) ampere-hour capacity (iv) Level of electrolyte. Use battery capacity tester. Clean the battery and charge it. Prepare a maintenance schedule.
4. Dismantle study, assemble and check for proper working the following: (a) Electric horn (b) Wiper motor (c) Starter motor (d) dynamo (e) alternator.
5. Test the following on electrical test bench: (a) Dynamo (b) Starter motor (c) Alternator. Also study the working of a growler.
6. Dismantle, inspect and assemble the magneto of a 2-wheeler. Set the ignition timing using dial gauge.
7. Dismantle and assemble the given electrical fuel pump. Check it for proper working.
8. Set the cut-out and regulator of a vehicle.
9. Dismantle, study, and re-assemble multi-cylinder F.I. pump.
10. Test a multi-cylinder F.I. pump on calibrating machine and check it for proper phasing. Set the injection timing on the engine.
11. Test a diesel fuel injector and set injection pressure. Grind needle and seat.
12. Study and sketch rotary F.I. pump.
13. Study of working of electric vehicle.
14. Study and sketch the Electrical Wiring System of a Car.

Design of Automotive Systems Lab

1. Design of automotive clutch assembly and component drawing using any drafting software (Two full imperial sheets along with design calculations report) consists of:

- Functional design of clutch
- Design of clutch shaft, hub and flange
- Design of damper springs
- Design of sectors, rivets etc.
- Design of pressure plate assembly
- Design for linkage mechanism
- Details and assembly drawing
- Details and assembly drawing

2. Design of automotive gear box along with reverse gear (Two full imperial sheets along with design calculationsreport) consists of:

- Calculation of gear ratios
- Determination of number of teeth on gear pair
- Determination of gear reductions
- Design of gear pairs
- Design of shafts
- Selection of bearings
- Details and assembly drawing

3. Design of suspension spring and its analysis using any analysis software.

Automobile Maintenance Service & Repairs – I

Unit 1:

Workshop Equipment

Equipment for testing electrical accessories: Electric test bench, growler, coil tester, ignition and cam-dwell-angle tester; wiring harness tester. Ampere-hour battery tester, voltmeter tester, Layout of diesel injector and F.I.P. reconditioning shop, Tools and equipment required

Unit 2:

Lubrication and Maintenance Schedule

Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles (a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential (g) Axles and hubs

Unit 3:

Lubrication and Maintenance Schedule

(a) Suspension system (b) Steering system (c) Tyre (d) Chassis (e) Brake-drum and disc (f) Battery (g) Self starter (h) Dynamo

Unit 4:

Fuel System

Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipe lines, priming unit, tanks. Electricals: Maintenance Schedule of batteries, starter motor, dynamo, ignition system, wiper motor, electrical fuel pump, alternator, horn, flasher unit. Unit 5: Engine Tuning (a) Engine tuning of conventional and MPFI petrol engine. Adjustments of spark plug gap, valve tappet clearance, head bolts, Use of vacuum and compression gauge, Air cleaner cleaning, Ignition timing setting by timing light, Pollution checking, Troubleshooting

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House
2. Automotive Technology:Service And MaintenanceDon Knowles

Off-Road Vehicles

Unit 1:

Classification and Requirements of Off Road Vehicles

Introduction, pretest, history and overview of an off-road machines, construction layout, capacity and applications, power plants, chassis and transmission, multi-axle vehicles

Unit 2:

Earth Moving Machines

Different types of earth moving equipments and their applications. Bulldozers, cable and hydraulic dozers, Crawler track, running and steering gears, scrapers, drag and self powered types - Dump trucks and dumpers - Loaders, single bucket, multi bucket and rotary types - Power and capacity of earth moving machines.

Unit 3:

Farm Equipments& Tractors

Scrappers, elevating graders, motor graders, self powered scrappers and graders, power shovel, revolving and stripper shovels, drag lines, ditchers, capacity of shovels Tractors: General description, specification and functions, light, medium and heavy wheeled tractors, crawler tracks mounted / wheeled-bull dozers, tilt dozers and angle dozers, front end loaders, factors affecting efficiency of output of tractors, simple problems, merits and demerits

Unit 4:

Combat Vehicles and Vehicle Systems

Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles Vehicle Systems: Brake system and actuation – OCDB and dry disc caliper brakes. Body hoist and bucket operational hydraulics, Hydro-pneumatic suspension cylinders, Power steering system, Kinematics for loader and bulldozer operational linkages, Safety features, safe warning system for dumper, Design aspects on dumper body, loader bucket and water tank of sprinkler

Unit 5:

Vehicle Evaluation Mobility

Soil-Vehicle Mechanics, characteristics of soils, nominal ground pressure, mean maximum pressure, the mobility index (mi), vehicle cone index (vci) and rated cone index (rci), mobility number, dynamic behavior and traction on wet soil, traction performance and factors affecting traction performance

Reference Books:

1.Off-road Vehicle Dynamics: Analysis, Modelling and Optimization Hamid, Aref Mardani
2.Road and Off-Road Vehicle System, Manfred Ploechl
3.Off-Road Vehicles, Ian Graham

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Production Technology (PT)
Branch Code:103

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Production Technology

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV511	Machine Tool Technology	30	10	5	5	20	30		**50**	**2**
2	BPTV512	General Mechanical Engineering-I	30	10	5	5	20	30		**50**	**2**
3	BPTV513	Production Technology	30	10	5	5	20	30		**50**	**2**
4	BPTV514	Metrology and Measuring Instruments	30	10	5	5	20	30		**50**	**2**
5	BPTP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BPTP512	Machine Tool Technology Lab	30				20		30	**50**	**1**
7	BPTP513	Language Lab	30				20		30	**50**	**2**
8	BPTT511	Metal Arc Welding (CSC/Q0204)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BPTT512	MIG MAG or GMAW Welder (CSC/Q0209)									
	BPTT513	Assistant TIG Welder (CSC/Q0212)									
	BPTT514	CNC Setter Cum Operator (CSC/Q0120)									
	BPTT515	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV521	Industrial Management	30	10	5	5	20	30		**50**	**2**
2	BPTV522	Manufacturing Technology	30	10	5	5	20	30		**50**	**2**
3	BPTV523	Material Science and Materials	30	10	5	5	20	30		**50**	**2**
4	BPTV524	General Mechanical Engineering-II	30	10	5	5	20	30		**50**	**2**
5	BPTP521	Project	30				20		30	**50**	**1**
6	BPTP522	Basic Electricity and Electronics Lab	30				20		30	**50**	**1**
7	BPTP523	Mechanical Workshop Practice Lab	30				20		30	**50**	**2**
8	BPTT521	Metal Arc Welding (CSC/Q0204)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BPTT522	MIG MAG or GMAW Welder (CSC/Q0209)									
	BPTT523	Assistant TIG Welder (CSC/Q0212)									
	BPTT524	CNC Setter Cum Operator (CSC/Q0120)									
	BPTT525	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV631	Metal Casting Technology	30	10	5	5	20	30		**50**	**2**
2	BPTV632	Production Automation & Computer Integrated Mfg.	30	10	5	5	20	30		**50**	**2**
3	BPTV633	Fundamental of Mechatronics	30	10	5	5	20	30		**50**	**2**
4	BPTV634	Machining and Machine Tools	30	10	5	5	20	30		**50**	**2**
5	BPTH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		**50**	**2**
6	BPTP631	Metal Casting Technology Workshop	30				20		30	**50**	**1**
7	BPTP632	Mechatronics Lab	30				20		30	**50**	**1**
8	BPTT631	Service Engineer – Installation (CSC/Q0501)					Any one Training 400 hrs/ 8 weeks			**150**	**12**
	BPTT632	Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)									
	BPTT633	CNC Programmer (CSC/Q0401)									
	BPTT634	Maintenance Fitter – Mechanical (CSC/Q901)									
Total			**610**							**500**	**24**

NSFQ Level 6 SEMESTER- IV											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BPTV641	Mass Production Devices	30	10	5	5	20	30		**50**	**2**
2	BPTV642	Agile and Lean Manufacturing	30	10	5	5	20	30		**50**	**2**
3	BPTV643	Metal Forming Processes	30	10	5	5	20	30		**50**	**2**
4	BPTV644	Non-Conventional Machining	30	10	5	5	20	30		**50**	**2**
5	BPTH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		**50**	**2**
6	BPTP641	Tool and Die Making Lab	30				20		30	**50**	**1**
7	BPTP642	IT Tool Lab	30				20		30	**50**	**1**
8	BPTT641	Service Engineer – Installation (CSC/Q0501)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			**150**	**12**
	BPTT642	CNC Programmer (CSC/Q0401)									
	BPTT643	Quality Inspector – Forged, Casted or Machined Component (CSC/Q0601)									
	BPTT644	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			**610**							**500**	**24**

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BPTV751	Reliability ,Maintenance & Safety Engineering	30	10	5	5	20	30		50	2
2	BPTV752	Plant Layout and Product Handling	30	10	5	5	20	30		50	2
3	BPTV753	Product Design and Manufacturing	30	10	5	5	20	30		50	2
4	BPTV754	CAD & CAM	30	10	5	5	20	30		50	2
5	BPTH751	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BPTP751	CAD Lab	30				20		30	50	1
7	BPTP752	CAM Lab	30				20		30	50	1
8	BPTT751	Tool & Die Maker (CSC/Q0306)					Any one Training 400 hrs/ 8 weeks			150	12
	BPTT752	Designer – Mechanical (CSC/Q0405)									
	BPTT753	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BPTV761	Rapid Prototyping and Reverse Engineering	30	10	5	5	20	30		50	2
2	BPTV762	Production Planning and Control	30	10	5	5	20	30		50	2
3	BPTH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BPTP761	Major Project	180						150	150	6
5	BPTT761	Tool & Die Maker (CSC/Q0306)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BPTT762	Designer – Mechanical (CSC/Q0405)									
	BPTT763	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			670							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Machine Tool Technology

Unit 1: Centre Lathe

The centre lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Head stock and tail stock, feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrils, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe

Unit 2: Shaping, Planing& Slotting Machines

Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

DRILLING & BORING MACHINES: Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

Unit 3: Milling Machines

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks

Unit 4: Grinding Machines

Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing.

BROACHING MACHINES: Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines

Unit 5: Jigs and Fixtures

Object of Jigs and Fixture, Difference between jigs and fixtures, Principle of location, Principle of clamping, Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs-bushes (Fixed, Liner, Renewal, and Slip). Template, Plate jigs. Channel jigs, Leaf jigs, Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures. Welding fixtures

COOLING PROCESS: Cooling and cutting fluids, difference between coolant and cutting fluid, function and action of cutting fluids, Requirement of good cutting fluids, their selection for different materials and operationsAUTOMATION OF MACHINE TOOLS: Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

Reference Books:

1. Production Technology: Jain & Gupta
2. Workshop Technology Vol. II: Hazra&Choudhary

General Mechanical Engineering – I

Unit 1: Strength of Materials & Power

Transmission

Stress, strain, elastic constraints, stress in circular shaft subjected to pure torsion only, Riveted and bolted joints.

Unit 2: Shear Force & Bending Moment

Elementary idea of Shear force and bending moment for concentrated, uniformly distributed loads on simply supported beam cantilever and overhanging beam, Simple Shear force and bending moment diagrams, Relationship between shear force and bending moment

Unit 3: Power Transmission: Pulleys, Gears & Shaft

Classification of Pulleys, Types of Belts, Simple calculation of pulley diameter, Classification of Gears, Simple calculation of number of teeth and speed, Power transmission by solid and hollow shaft

Unit 4: Hydraulics & Hydraulic Machines

Properties of fluids, pressure of fluid and its measurement. Flow of fluids, velocity and discharge, Bernoulli's theorem and its application in venturimeter, flow through pipe, head loss due to friction

Unit 5: Water Turbines & Pumps

Capacity & Working of Turbines- Pelton and Reaction, reciprocating and centrifugal pump

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House

Production Technology

Unit 1

Production Machine Tools: Machine tools used for quantity production, semi-automatic multi tools centre lathe. Auto-lathes, sliding head types, Single spindle automatics, Multi-spindle automatics, Mechanical copying systems, Hydraulic servo copying systems for lathe, Electric copying systems.

TRANSFER MACHINES: Types of productions. Types of layout, Economic justification of transfer machines, Inline transfer, drum type transfer machines. Automatic loading & Transferring methods, Machining heads, Automatic inspections, Tool servicing, Transfer press linked lines.

Unit 2

Generation Of Forms: Forming `V' generating. Thread chasing. Die heads. Threadrolling. Thread milling. Thread grinding. Gear planning, Gear shaping, Gear hobbing, Straight Bevel Gear Manufacture. Spiral bevel Gear Manufacture.

Unit 3

Surface Treatment & Finishing: Meaning of the terms surface treatment and itspurpose, Elements of surface treatment cleaning protecting, Colouring, Altering surface properties.

Surface Treatment Processes- Wire brushing, Belt sanding, Alkaline cleaning, Vapour degreasing, Pickling, Latest trends in Surface preparation, Ultrasonic cleaning, Solvent cleaning, Painting application by dipping, Hand spraying, Automatic spraying, Electrostatic spray finishing. Electro-coating, Hot dip coating, phosphate coating- Packerising and bonderasing, Buffing, Blackening, Anodising. Electro Nickle Plating, Nickle carbide plating, Sputtering, Automation in Painting,

AUTO CONTROL OF SIZE: Auto sizing, Mechanical calliper for turning operation, Pneumatic sizing of external cylindrical ground work, Pneumatic slide position measuring device, Digital slide position measuring device, Auto sizing device for centre-less grinding operation. Friction rollers, Optical measurement

Unit 4

Cutting Tools For Machining: Elements of machining process, Single point tools -Basic angles, Chip formation, Effect of manipulating factors such as velocity, size of cut, effect of tool geometry, Tool material, Cutting fluids and contamination in them, Work piece material, Tool life model, Machining economics, Specific power consumption

Basic principles of multipoint tools, Linear travel tools, Broaches, Gear shaper cutters, Axial feed rotary tools-Twist drill, Reamers, Core drills, Counter bores and counter sinks, Multiple diameter tools, Hobs,Characteristics of tools materials,. Tool materials, Tool steels, High speed steel, Cast cobalt alloys. Carbides or cintered carbide, Ceramics, Carbide tools

Surface treatment of cutting tools- Its advantage, Tin coated high speed steel diamonds. Cubic boron nitrides, Specialised knowledge of steel cutting

Unit 5

Press Tools: Factors affecting press tool design, Shearing, Bending, Drawing,combination tools, Progression tools, Rubber die formatting, high energy forming, Explosive formingSPECIFICATION OF QUALITY & RELIABILITY: Quality, Specification Designing for production Standardisation, Preferred numbers, Limits and fits, Tolerance build up, Geometric tolerances. Limit gauging

Reference Books:

(i) Production Engineering: PC Sharma

(ii) Production Technology: CK Singh

Metrology and Measuring Instruments

Unit 1

Introduction: Meaning and scope of metrology in field of engineering, Standards andtypes of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error
PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:
(i) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw andscrew nut method, compound gearing and helical spring methods.
(ii) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors.
(i) Principles of Electrical measuring Instruments.
(ii) Principles of Hydraulic and Pneumatic Instruments.

Unit 2:
Comparators
General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

Unit 3:
Surface Finish
Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

Unit 4
Various Types of Instruments Used For:
1. (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer

2. Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only)

TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

Unit 5

Inspection of Geometrical Errors:
Construction and working of auto collimeter,checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod).

Maintenance Of Measuring Instruments: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:
1. Metrology: RK Jain
2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments lab.

Bridge Course to be merge with practical classes:

Introduction of scale, orthographic projection, simple drawing of mechanical components, and cut sections, significance of various types of lines used in engineering drawing, representation of material, brief idea of isometric projections

Types of thread, single start, multi start thread and their application

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto- collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Machine Tool Technology Lab.

(A) MACHINE SHOP

1. (a) Square thread cutting (internal and external) - 2 jobs

   (b) Multi-start thread cutting - 1 job

   (c) Eccentric Turning - 1 job

2. Making utility job - Planner, Shaper, Slotter - 1 job

3. Group work on milling machine involving up & down milling in:

   (a)Gang milling - 1 job

   (b)Spur gear cutting - 1 job

   (c)Helical gear cutting - 1 j

(B) FITTING SHOP

1. To make a cut and cup tool - 1 job
2. To make blank and pierce tool - 1 job
3. To make a male and female fitting jobs - 1 job
4. To grind a lathe/shaper/planer tool - 1 job
5. To make different types of keys - 3 jobs
6. To make complete gauge - 2 jobs

Level 5 (Semester II)
Industrial Management

Unit 1

Introduction

Growth of industry, The management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

Unit 2

Private sector and public sector:

Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit 3

Wages & incentives

Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.

Unit 4

Labour, industrial & tax laws:

Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit 5

Material management:

Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards.

Reference Books:

1. Industrial Engineering and Management, S.C. Sharma, Khanna Publishing House
2. Industrial Safety, S.C. Sharma, Khanna Publishing House
3. Industrial Engineering & Management: Banga, Sharma & Agrawal
4 . Industrial Engineering Safety & Pollution (Hindi): HemendraDutt

Manufacturing Technology

Unit 1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Riveting, Elementary idea of machines used for the above processes.

Unit 2

WELDING:

(a) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

(b) Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding and Gas welding (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG) (vi) Tungsten Inert Gas welding (TIG)

WELDING OF SPECIAL MATERIALS: (a) Welding of carbon steel, Low alloy steel and stainless steel, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron (c) Welding of Aluminium (d) Welding of Plastics.

Unit 3

Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools-Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility.

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Unit 4

Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects

MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting.

FOUNDRY PRACTICE: Elementary idea of special casting processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanization of foundries

Unit 5

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)
TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods-Tensile Test, Hardness Test, Fracture Test, Impact Test (b) Nondestructive methods-visual, Liquid Penetrant Testing, Magnetic particles Testing, Radiographic Testing.
Advance Welding Process: Plasma Arc Welding, Laser Beam Welding, Electron Beam welding, Atomic Hydrogen arc welding, Stud welding, Explosion welding.

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi
2. Production Technology, Vol. I: Hazra& Chaudhry

Material Science & Materials

Unit 1

General:

Brief introduction to the subject and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

STRUCTURE OF METALS AND THEIR DEFORMATION:

Structure of metals and its relation to their physical, mechanical and technological properties, Elementary idea of arrangement of atoms in metals, molecular structures, crystal structures and crystal imperfections, Deformation of metals, effects of cold and hot working operations over them. Recovery re-crystallization and grain growth, solid solutions, alloys and inter metallic compounds, effect of grain size on properties of metals. PROPERTIES AND USAGE OF: (1) Metals: (a) Ferrous Metals (b) Non Ferrous Metals (2) Non-metallic Materials.

Unit 2:

Metals-Ferrous Metals

1. Classification of iron and steel. (b) Cast iron types as per I.S. - White, malleable, Grey (c) Steels: Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Availability of steel in market, Its forms and specifications (d) Alloy Steel: Effect of alloying various elements, viz Cr, Hi, Co, V,W, Mo, Si, and Mn, on mechanical properties of steel, Common alloy steels, viz, Ni-steel, Ni-Cr-steel, Tungsten steel, Cobalt steel, Stainless Steel, Tool steel - High Carbon Steel, High Speed steel, Tungsten Carbide, Silicon manganese steel, Spring Steel, Heat Resisting alloy Steels etc.

Unit 3:

Non-Metallic Materials

Introduction to Plastic and Other Synthetic Materials: Plastics- Important sources-Natural and Synthetic, Classification, thermo-set and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms of Plastics

Heat Insulating Materials: Classification of Heat Insulating material, properties and uses of China clay, Cork, Slag wool, Glass Wool, Thermocole, Puff, Properties and uses of asbestos as filler material.

Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. Pipes and their uses. General sheets specification (I.S.) and uses, Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fitting

Unit 4

IDENTIFICATION AND TESTING OF METAL ALLOYS: Selection, specification forms and availability of materials.

HEAT TREATMENT OF METALS: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. and `S' curve in steels and its significance, Hardening, Tempering, Annealing, Normalising and case hardening

Reference Books:

Material Science: RS Khurmi& RS Shedha

General Mechanical Engineering - II

Unit 1:

Basics of Thermodynamics

Basic definition of heat, work, Thermodynamic process, parameters of working body and their units, Equation of state, Universal gas constant, Relation between heat capacity and temperature. Determination of quantity of heat

Unit 2:

Laws of Thermodynamics

Elementary concept of laws of thermodynamics, first law and second law, Graphical representation of process, The work of expansion and compression of a gas, Change in the state of ideal gas-Isochoric, Isothermal and Adiabatic process, Carnot-cycle

Unit 3:

IC Engines

External & internal combustion engines, working of diesel and petrol engine, horse power of IC engines,

Unit 4:

Steam Generators & Condensers

Construction and working of Babcock & Wilcox boiler, Cochran boiler, Steam condenser & its types

Unit 5: Steam & Gas Turbines

Steam turbine, classification and principle of operation, gas turbine

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House
3. General Mechanical Engineering: Jk Kapoor
4. Mechanical Engineering: Khurmi& Gupta

Project

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Basic Electricity & Electronics - Lab

Bridge course:

Introduction to current, voltage, resistance, capacitance, impedance, diode, zener diode, transistors, amplifiers, electric cells

1. Study of series resistive circuits.
2. Study of parallel resistive circuits.
3. Study of series and parallel connection of cells in circuits.
4. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
5. Charging and Discharging of a capacitor.
6. Verification of magnetic field of solenoid with Iron core and Air core.
7. Verification of Torque development in a current carrying coil in magnetic field.
8. Study of R.L.C. series circuit and measurement of power and power factor.
9. Study of current and voltage measurement using Ammeter and Voltmeter.
10. Study of current and voltage measurement using Galvanometer.
11. Study of current, voltage and resistance measurement using of Multi-meter
12. Study of Power and Energy measurement using Wattmeter and Energy meter.
13. Study of working of single layer PCB manufacturing.
14. Study of working of double layer PCB manufacturing.
15. Study and interpreting circuit diagram and to check the continuity of connections.

Instrument Required:

1. Trainer kit for measuring TCR
2. Lead acid battery
3. Hydrometer
4. Trainer kit for measuring power and power factor in RLC circuits
5. Ammeter
6. Voltmeter
7. Multi-meter
8. Galvanometer
9. Energy Meter
10. PCB Manufacturing Facility

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.

5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (SEMESTER- III)
Metal Casting Technology

Unit 1

Introduction
Design advantages of casting, Advantages of casting process, Metallurgical advantage. Technology of pattern making requirement, Pattern material, wood &wood product, plaster, Plastics and rubbers, Polyesters resins waxes, Machines and tools for pattern making machine for wood pattern making, Machines for metal pattern making, Allowance and other Technological considerations – contraction allowance, Machining allowance, Draft or taper allowance, Rapping and shake allowance, Distortion allowance, Core Prints, Core boxes, Use of loose pieces

Unit 2

Technology of moulding and core making
Moulding sands, Principal ingredients of moulding sands, Specification and testing of moulding sands, Classification of Moulding sands, Additives to moulding and Core making sands, Mould Dressings. Sand Conditioning, Sand Preparation equipment.

Unit 3

Moulding processes
Types of sand moulding, Tools for hand moulding, Characteristics of cores and core sands, Types of cores, Use of chaplets, Machine moulding, Core making machines, Processes based on organic binders.

Unit 4

Technology of metal casting processes
Permanent mould casting, Types of die casting machines, Centrifugal casting, continues casting, Electro slag casting, Gating system, Riser of casting, Economic considerations, Melting equipments for foundries, Defects in castings.

Unit 5

Modernization & Mechanization of foundries
Need, Area for mechanization, Material handling, Pollution control in foundries, Pollutants in a foundry, Plant layout for foundries, steps in planning a foundry layout.

Reference Books:

1. Evolution of Metal Casting Technologies,Khan, Muhammad Azhar Ali, Sheikh, Anwar Khalil, Al-Shaer, Bilal Suleiman
2. Foundry technology,Peter R. Beeley

Production Automation & Computer Integrating Manufacturing

UNIT 1

General: Automation-Definition, Scope, its types and their merits, reasons for automation, Its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM) Relationship between CIM and Automation FUNDAMENTALS OF MANUFACTURING AND AUTOMATION: Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production). Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control

UNIT 2

Production Concept:

Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing. PRODUCTION ECONOMICS: Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process.

UNIT 3

Assembly System and Line Balancing:

The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line AUTOMATED ASSEMBLY SYSTEMS: Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines, Analysis of single station assembly machines

UNIT 4:

Numerical Control Production System

Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS

UNIT 5

N.C. Part Programming: Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part programming using CAD/CAM and Computer automated part programming. DNC, CNC & ADAPTIVE CONTROL: Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System)

Reference Books:

1. Numerical Control Machines: NK Mehta
2. Production Automation & Computer Integrated Manufacturing: MP Groover

Fundamentals of Mechatronics

Unit 1.

Introduction: Introduction to Mechatronics, systems, measurement systems, control systems, the Mechatronics approach. Introduction to Transducers: Sensors and transducers, operating characteristics of transducers, measurement of displacement, velocity, pressure, flow, and temperature.

Unit 2.

Signal conditioning: Signal conditioning- their features and various blocks, the operational amplifiers, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing. Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition system, Telemetry- electrical, optical and pneumatic methods of telemetry.

Unit 3.

Introduction to process control systems: Importance of process control, analog and digital processing, Supervisory digital control, direct digital control. Controller Characteristics: Process characteristics, control system parameters, Discontinuous controller modes (two position, multiple position, floating position), Continuous controller modes i.e. P, I, D, PI, PD, PID.

Unit 4.

Introduction of Mechanical Actuation Systems: Mechanical Actuation Systems for motion, Kinematics chains, Cams, Gear trains, Belt and chain drives, Bearings. Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Process control valves, rotary actuators.

Unit 5.

Introduction of Electrical Actuation Systems: Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors.

Reference Books:

1. Mechatronic Systems: Fundamentals,R. Isermann
2. Fundamentals Of Mechatronics,M.Jouaneh

Machining and Machine Tools

Unit 1
Classification of Metal Removal Process and Machines Mechanics of Metal Cutting:

Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS, NRS and interrelationship, introduction of mechanism of chip formation and types of chips, chip breakers, orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface, temperature, friction in metal cutting.

Unit 2
Machinability:

Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability, Cutting fluids, types, properties, selection and application methods, General Purpose Machine Tools: tooling, attachments and operations performed, selection of cutting parameters, Simple calculation of time for machining.

Unit 3
Special Purpose Machine Tools:

Automatic lathes, capstan and turret lathe machines, tracer attachment in machine tools, mechanical-copying machines, Hydraulic tracing Devices, Electric tracing systems, Automatic tracing, Abrasive Processes: Abrasives, natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding, machines for surface and cylindrical grinding, their constructional details and processes, surface finishing, honing, lapping, super finishing, polishing and buffing processes.

Unit 4
Thread and Gear Manufacturing:
Casting, thread chasing, thread cutting on lathe, thread rolling, die threading and tapping, thread milling, thread grinding, Gear Manufacturing Processes: Hot rolling, stamping, powder metallurgy, extruding etc. gear generating processes, gear hobbling, gear shaping, gear finishing processes, shaving, grinding, lapping, shot blasting, phosphate coating, gear testing.

Unit 5
High Velocity Forming Methods:
(High-energy rate forming processes) Definition, Hydraulic forming, explosive forming, electro-hydraulic forming, magnetic pulse forming

Reference Books:
1. Machine Design, Sadhu Singh, Khanna Publishing House
2. Machine Design Data Book, Sadhu Singh, Khanna Publishing House

Metal Casting Technology Workshop

Minimum work in each section is indicated against that PATTERN MAKING: (a) Making Patterns (At least two) (i) Solid one-piece pattern (ii) Split tow piece pattern (iii)Split three-piece pattern (iv) Gated pattern (b) Making Core Boxes (At least one) (i) Straight Core Box (ii) Bent Core Box.

MOULDING SAND PREPARATION AND TESTING: (a) Sand Testing (At least one Experiments) (i) Grading (Grain Size). (ii) Determination of Moisture content (iii) Determination of Clay content. (iv) Determination of Permeability for gases (b) Preparation of: (i) Green Sand Composition. (ii) Dry sand Composition. (iii)Loan Sand composition (iv) Oil Sand for Cores.

MOULDING: (a) Making at least 3 sands moulds of different forms with different types of pattern using. (i) Floor Moulding. (ii) Two Box Moulding. (iii)Three Box (or more) Moulding. (b) At least one of the following: (i) Making and setting of cores of different types. (ii)Making one shell mould apparatus

(C) MELTING AND POURING: (Each to be demonstrated at least once in the section). (a) Demonstration of Melting of cast iron in (i) Pit Furnace. (ii) Cupola. (b) Demonstration of Melting a non-Ferrous metal in (i) Pit furnace. (ii) Tilting Furnace. (c) Pouring of metals in moulds (Ferrous and Non-Ferrous).

(D) CLEANING AND INSPECTION: (a) Shaking, cleaning and fettling of casting (At least 2 Casting) (b) (i) Inspection of cast component (visual) and preparing inspection report (At least one report). (ii) Establishing cause of Defects seen (At least one cause).

(E) CASE STUDY OF: At least 2 sand castings produced from sand preparation pattern layout to final finished casting.

Mechatronics Lab

1. Displacement Measurement using Capacitive & inductive Pick –ups.
2. Study of Speed Measurement System: (a) Magnetic Pick-up (b) Stroboscope
3. Study of Load Measurement System Load Cell
4. Measurement of temperature using thermocouple, thermistor and RTD
5. Measurement of displacement using POT, LVDT & Capacitive transducer
6. Torque measurement using torque measuring devices
7. Strain Measurement using strain gauge
8. Frequency to Voltage Converter and vice versa
9. Position and velocity measurement using encoders
10. Study on the application of data acquisition system for industrial purposes

Level 6 (Semester IV)

Mass Production Devices

Unit 1

Tool holders: Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

Unit 2

Locating and clamping devices: Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

Unit 3

Clamping devices: Types, Sketches with nomenclature, Working, Applications

Unit 4

Jigs and fixtures: Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures

Unit 5

Design of Jigs and Fixtures: Steps in designing jigs and fixture for given simple component

Reference Books :

1. Mass Production ,phaidon

Lean and Agile Manufacturing

Unit 1

Introduction-

Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

Unit 2

Waste Identification-

Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

Unit 3

Value stream mapping-

Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

Unit 4

Lean manufacturing tools-

Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

Unit 5

Agile manufacturing-

Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:

1. Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities,Devadasan S.R
2. Learning Agile: Understanding Scrum, XP, Lean, and Kanban,Andrew Stellman, Jennifer Greene

Metal Forming Processes

Unit 1

Rolling

Introduction, Types of rolling, Hot rolling, Two high reversing mill, Three high mill, Continuous mill, Roll bending

Unit 2

Forging

Introduction, Advantages of Forging, Application of Forging, Limitations of Forging, Upsetting, Hollow Forging, Impression die or closed, Methods of Forging, Drop Forging, Press Forging, Hammer and press Forging, Hot bar Forging, Upset Forging

Unit 3

Extrusion

Direct and forward, Sleeve method of direct, Indirect or backward, Impact Extrusion, Tube Extrusion, Stepped Extrusion, Combined forging and Extrusion

Unit 4

Drawing

Wire Drawing, Cupping and Bending, Tube Drawing, Spinning, Hot and cold Spinning Advantages of Metal Spinning

Unit 5

Pipe and Tube Production-

Manufacturing of seamless pipe- Butt welded pipe- Lap welded pipe

Reference Books:

1. Sheet Metal Forming Processes: Constitutive Modelling and Numerical Simulation,D. Banabic
2. Metal Forming Processes ,G. R. Nagpal

Non-conventional Machining

Unit-I
Introduction:
Limitations of conventional manufacturing processes need of unconventional manufacturing processes and its classification.

Unit-II
Un-Conventional Machining Processes:
Principle and working and applications of unconventional machining processes such as Electric Discharge machining (EDM), Electro- Chemical machining (ECM), Ultrasonic Machining (USM), and Abrasive Jet machining (AJM)

Unit-III
Un-Conventional Welding Processes:
Principle and working and applications of unconventional welding processes such as Laser Beam Welding, Electron Beam Welding, Ultrasonic Welding, Plasma Arc Welding processes.

Unit-IV
Explosive Welding:
Cladding etc. Under water welding, Metalizing Theory, Process and applications

Unit-V
Un-conventional forming processes:
Principle and working and applications of high energy forming processes such as Explosive forming, Electromagnetic forming. Electro discharge forming Water hammer forming, Explosive Compaction

Reference Books:
1. Modern Machining Process, P.C. Pandey
2. Un-conventional machining, V.K. Jain

Tool & Die Making Lab

- Manufacture of Box Jig and Angle plate jig
- Manufacture of DzVdz Block angle grinding Fixtures and profile milling fixture
- Manufacture of simple Blanking & piercing Tool
- Manufacture of Progressive tool for producing a Cycle chain link
- Manufacture of Press tools like Combination tool & Compound tool
- Manufacture of Draw tool
- Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup Washer and Cycle bell cup
- Manufacture of simple V and U bending tool
- Maintenance of Jig & fixture and press tool

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 7 (Semester V)
Reliability, Maintenance and Safety Engineering

Unit 1
Reliability
Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit 2
Constant Failure rate model
Exponential Reliability function, Failure Modes, CFR model, memory lessness, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit 3
Design for reliability
Reliability specifications and system measurements, System Effectiveness, redundancy, Classification of Redundancy, Introduction of failure mode and effect analysis (FMEA)

Unit 4
Maintainability
Analysis of Downtime, repair time distribution, stochastic point processes.

Unit 5
Safety engineering
Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives

Reference Books:

1. Reliability Engineering, S.C. Sharma, Khanna Publishing House
2. Reliability, Maintenance and Safety Engineering,A.K. Gupta

Plant Layout & Product Handling

Objective of Facility Design: Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

Computerized handling of layout algorithms; Algorithms for computerized Layout Planning, Construction and Development type of computerized Layout Planning Techniques i.e. CRAFT, ALDEP, CORELAP etc.;

Product handling; Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, fork lifters;

Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

Application of pneumatic and hydraulic system in transportation and handling of products, Design of integrated plant layout for product handling systems

Reference Books:

1. Plant Layout and Materials Handling, S. C. Sharma
2. Plant Layout and Materials Handling ,R. B. Choudhary and G. R. N. Tagore

Product Design for Manufacturing

Unit 1

Importance of New Product

Importance of new product for growth of enterprise, Definition of product and new product, Classification of products from new product development point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products

Unit 2

New product development process and organization

Generic product development process for Market Pull and Market Push Products, Need Identification and Analysis, Problem Formulation, establishing economic existence of need, Engineering Statement of Problem, Establishing Target Specification

Unit 3

Generation of Alternatives and Concept Selection

Introduction to Concept generation, Tools of creativity like brain storming, Analogy, Inversion, introduction to Concept feasibility and Concept Selection, Establishing Engineering Specification of Products

Unit 4

Preliminary and Detailed Design

Preliminary design, Identification of subsystems, Subsystem specifications, detailed design of subsystems, component design

Unit 5

Assembly drawing and review

Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics

Reference Books:

1. Manufacturing Processes for Design Professionals, Rob Thompson
2. Product design for manufacture and assembly, Geoffrey Boothroyd

CAD & CAM

Unit 1

Introduction CIM and CAD & Analysis:

CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

Unit 2

Computer aided Manufacturing CAM:

Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

Unit 3

CNC Machine and Components:

CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

Unit 4

Part Programming

NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

Unit 5

FMS, Integrated Material Handling and Robot:

Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House
2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.

CAM Lab

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation

Level 7 (Semester VI)
Rapid Prototyping and Reverse Engineering

Unit 1
Introduction
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Unit 2
CAD Modelling and Data Processing for RP
CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

Unit 3
RP Systems
Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes. Extrusion - Based RP Systems, 3D Printing process modelling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

Unit 4
Rapid Tooling:
Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Unit 5
RP Applications:
Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP

Reference Books:
1. Rapid Product Development (English, Paperback, Kimura Fumihiko

Production Planning and Control

Unit 1

Demand Forecasting

Introduction, components of forecasting demand, Approaches to forecasting: forecasts based on judgment and opinion, Selection of forecasting technique.

Unit 2

Capacity Planning

Defining and measuring capacity, determinants of effective capacity, capacity strategy, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives; Cost-Volume analysis.

Unit 3

Facility Location

Need for location decisions, factors affecting location, qualitative and quantitative techniques of location. Facilities layout: Product, Process, fixed position, combination and cellular layouts; Designing product and process layout, line balancing.

Unit 4

Production Control

Capacity control and priority control, production control functions; Routing, scheduling, Dispatching, expediting and follow up, Techniques of production control in job shop production, batch production and mass production systems

Unit 5

Sequencing

Priority rules, sequencing methods, sequencing jobs through two work centers, scheduling services, application of CPM and PERT techniques.

Reference Books:

1. Production Planning and Control,W. Bolton
2. Production Planning and Control with SAP,Jörg Thomas Dickersbach and K. Weihrauch

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc
Industrial Tool Manufacturing(IM)
Branch Code:104
Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme

B. Voc Industrial Tool Manufacturing

NSFQ Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV511	Machine Tool Technology		10	5	5	20	30		**50**	**2**
2	BIMV512	General Mechanical Engineering – I	30	10	5	5	20	30		**50**	**2**
3	BIMV513	Manufacturing Technology -I	30	10	5	5	20	30		**50**	**2**
4	BIMV514	Metrology and Measuring Instruments	30	10	5	5	20	30		**50**	**2**
5	BIMP511	Metrology and Measuring Instruments Lab	30				20		30	**50**	**1**
6	BIMP512	Machine Tool Technology Lab	30				20		30	**50**	**1**
7	BIMP513	Language Lab	30				20		30	**50**	**2**
8	BIMT511	Metal Arc Welding (CSC/Q0204)						Any one Training 400 hrs/ 8 weeks		**150**	**12**
	BIMT512	MIG MAG or GMAW Welder (CSC/Q0209)									
	BIMT513	Assistant TIG Welder (CSC/Q0212)									
	BIMT514	CNC Setter Cum Operator (CSC/Q0120)									
	BIMT515	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV521	Total Quality Management	30	10	5	5	20	30		**50**	**2**
2	BIMV522	General Mechanical Engineering – II	30	10	5	5	20	30		**50**	**2**
3	BIMV523	Manufacturing Technology -II	30	10	5	5	20	30		**50**	**2**
4	BIMV524	Industrial Engineering	30	10	5	5	20	30		**50**	**2**
5	BIMP521	Project	30				20		30	**50**	**1**
6	BIMP522	Engineering Graphics	30				20		30	**50**	**1**
7	BIMP523	Mechanical Workshop Practice	30				20		30	**50**	**2**
8	BIMT521	Metal Arc Welding (CSC/Q0204)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		**150**	**12**
	BIMT522	MIG MAG or GMAW Welder (CSC/Q0209)									
	BIMT523	Assistant TIG Welder (CSC/Q0212)									
	BIMT524	CNC Setter Cum Operator (CSC/Q0120)									
	BIMT525	CNC Operator – VMC (CSC/Q0116)									
Total			**610**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BIMV631	Tool Engineering – I	30	10	5	5	20	30		50	2
2	BIMV632	Production Automation & Computer Integrated Mfg	30	10	5	5	20	30		50	2
3	BIMV633	Fundamentals of Mechatronics	30	10	5	5	20	30		50	2
4	BIMV634	Machining and Machine Tools	30	10	5	5	20	30		50	2
5	BIMH631	Uni. Human Values & ethics/Env. & Eco.	30	10	5	5	20	30		50	2
6	BIMP631	Tool Engineering Lab	30				20		30	50	1
7	BIMP632	Mechatronics lab – Practical	30				20		30	50	1
8	BIMT631	Service Engineer – Installation (CSC/Q0501)					Any one Training 400 hrs/ 8 weeks			150	12
	BIMT632	Quality Inspector-Forged, Casted or Machined Component (CSC/Q0601)									
	BIMT633	CNC Programmer (CSC/Q0401)									
	BIMT634	Maintenance Fitter – Mechanical (CSC/Q901)									
	BIMT635	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BIMV641	Tool Engineering – II	30	10	5	5	20	30		50	2
2	BIMV642	Agile and Lean Manufacturing Systems	30	10	5	5	20	30		50	2
3	BIMV643	Metal Forming Processes	30	10	5	5	20	30		50	2
4	BIMV644	Mass Production Devices	30	10	5	5	20	30		50	2
5	BIMH641	Env. & Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BIMP641	Tool and Die Making Lab - Practical	30				20		30	50	1
7	BIMP642	IT Tool Lab	30				20		30	50	1
8	BIMT641	Service Engineer – Installation (CSC/Q0501)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			150	12
	BIMT642	Quality Inspector-Forged, Casted or Machined Component (CSC/Q0601)									
	BIMT643	CNC Programmer (CSC/Q0401)									
	BIMT644	Maintenance Fitter – Mechanical (CSC/Q901)									
	BIMT645	CNC Setter Cum Operator – VMC (CSC/Q0123)									
Total			610							500	24

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV751	Reliability, Maintenance & Safety Engineering	30	10	5	5	20	30		**50**	**2**
2	BIMV752	Design Concepts in Engineering	30	10	5	5	20	30		**50**	**2**
3	BIMV753	Product Design and Development	30	10	5	5	20	30		**50**	**2**
4	BIMV754	CAD & CAM	30	10	5	5	20	30		**50**	**2**
5	BIMH751	Indian Constitution / Essence of Indian Tradtional Knowledge	30	10	5	5	20	30		**50**	**2**
6	BIMP751	CAD Lab	30				20		30	**50**	**1**
7	BIMP752	CAM Lab	30				20		30	**50**	**1**
8	BIMT751	Tool & Die Maker (CSC/Q0306)					Any one Training 400 hrs/ 8 weeks			**150**	**12**
	BIMT752	Designer – Mechanical (CSC/Q0405)									
	BIMT753	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			**610**							**500**	**24**

NSFQ Level 7 SEMESTER- VI											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BIMV761	Rapid Prototyping and Reverse Engineering	30	10	5	5	20	30		**50**	**2**
2	BIMV762	Process Planning and Cost Estimation	30	10	5	5	20	30		**50**	**2**
3	BIMH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		**50**	**2**
4	BIMP761	Major Project	180						150	**150**	**6**
5	BIMT761	Tool & Die Maker (CSC/Q0306)				Any one Training (other than 5thsem) 400 hrs/ 8 weeks				**200**	**12**
	BIMT762	Designer – Mechanical (CSC/Q0405)									
	BIMT763	Service Engineer – Breakdown Service (CSC/Q0503)									
Total			**670**							**500**	**24**

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester I)
Machine Tool Technology

Unit 1: Centre Lathe

The centre lathe and its principle of working, Types of lathes, Lathe specification and size, Features of lathe bed, Head stock and tail stock, Feed mechanism and change-gears. carriage saddle, Cross slide, Compound rest, Tool post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe doges, mandrils, Steady rest, Lathe attachments, Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving, Types of lathe tools and their uses, Brief description of semi-automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe.

Unit 2: Shaping, Planing& Slotting Machines

Working principles of planer, shaper and Slotter, Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry, General and periodic maintenance of a shaper.

DRILLING & BORING MACHINES: Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

Unit 3: Milling Machines

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rake milling, cutting speed and speed for different tools in up and down milling. Simple, compound and differential indexing, milling of spur gears and racks

Unit 4: Grinding Machines

Common abrasives, grinding wheel materials, Bonds, Grain and grit of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding, Types of grinding machines, precision finishing operations like honing.

BROACHING MACHINES: Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines

Unit 5: Jigs and Fixtures

Object of Jigs and Fixture, Difference between jigs and fixtures, Principle of location, Principle of clamping, Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs-bushes (Fixed, Liner, Renewal, and Slip). Template, Plate jigs. Channel jigs, Leaf jigs, Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures,Welding fixtures

COOLING PROCESS: Cooling and cutting fluids, difference between coolant and cutting fluid, function and action of cutting fluids, Requirement of good cutting fluids, their selection for different materials and operationsAUTOMATION OF MACHINE TOOLS: Introduction to CNC lathe (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

Reference Books:

1. Production Technology: Jain & Gupta
2. Workshop Technology Vol. II: Hazra&Choudhary

General Mechanical Engineering - I Unit 1:

Strength of Materials & Power Transmission

Stress, strain, elastic constraints, stress in circular shaft subjected to pure torsion only, Riveted and bolted joints.

Unit 2: Shear Force & Bending Moment

Elementary idea of Shear force and bending moment for concentrated, uniformly distributed loads on simply supported beam cantilever and overhanging beam, Simple Shear force and bending moment diagrams, Relationship between shear force and bending moment

Unit 3: Power Transmission: Pulleys, Gears & Shaft

Classification of Pulleys, Types of Belts, Simple calculation of pulley diameter, Classification of Gears, Simple calculation of number of teeth and speed, Power transmission by solid and hollow shaft

Unit 4: Hydraulics & Hydraulic Machines

Properties of fluids, pressure of fluid and its measurement. Flow of fluids, velocity and discharge, Bernoulli's theorem and its application in venturimeter, flow through pipe, head loss due to friction

Unit 5: Water Turbines & Pumps
Capacity & Working of Turbines- Pelton and Reaction, reciprocating and centrifugal pump

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House

Manufacturing Technology –I

Unit 1

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming, Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).
(B) Carpentry: (a) Fundamental of wood working operations (b) Common Carpentry Tools- Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

Unit 2

(A) Joining of Timber Components for Fabrications Works: Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-simple lap and butt, Mortise, Tenon, Dovetail, Miter &briddle joints.
Metal Fabrication
(B) Metal Shaping-Smithy: (i) Operations involved (concept only) (ii) Tool and equipment used (Names, size, specification for identification only) (iii) Heating and fuel handling equipment (iv) Holding and supporting tools (v) Striking Tools (vi) Cutting tools (vii) Punching & Drifting Tools (viii) Bending Tools and figures (ix) Forming & Finishing Tools (x) Defects Occurring & its remedy

Unit 3

Sheet metal Working-Tools and operation: (1) Operations involved (Names and concept only) (2) Sheet metal joints (3) Tools and equipment used (Name, size, specifications for identification only) (4) Marking tools (5) Cutting and shearing Tools (6) Straightening tool
(7) Striking Tools (8) Holding Tools (9) Supporting Tools (10) Bending tools (11) Punching-Piercing and Drafting tools (12) Burring Tools-Files (13) Defects Occurring & its remedy

Unit 4

(A) Metal Joining During Fabrication-
(a) Permanent Joining: (i) Welding methods (ii) Electric welding
(b) Soldering & Brazing: (i) Its concept, comparison with welding as joining method and classification (ii) Soldering operation (iii) Materials Used (iv) Defects Occurring & its remedy
(B) Riveting- (i) Its comparison with welding as joining method. (ii) Rivets and Materials. (iii) Operation involved (iv) Tools and equipment used (Names, Size, specification and uses)), Elementary knowledge about working of pneumatic, hydraulic and electric riveter. Temporary Joining (Fasteners & their uses), General Idea about temporary fasteners & their uses
(C) Familiarity with the Use of Various Tools Used in Mechanical Engineering Workshop (a)Marking & Measuring Tools (b) Holding Tools (c) Cutting Tools (d) Files (e) Thread Cutting Tools (h) Miscellaneous Tools
They should be shown physically to each student for familiarity.

Unit 5

(A) Protection of Fabricated Structures from Weather:

(a) Painting: Its need, Introduction to methods of painting (classification only) operations involved description steps only, surface preparation materials, tools and equipment used (name, size specification for identification), Brushes-round and flat wire brush, scraper, trowel, spray gun, compressor, defects likely to occur in painting and their remedies

(b) Varnishing & Polishing: Its need, operation involved (description of steps only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish, copal varnish, defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed

(B) Foundry Work:

Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Workshop Technology, Vol. I: BS Raghuwanshi3. KaryashalaTakniki: JK Kapoor

Metrology and Measuring Instruments

Unit 1

Introduction: Meaning and scope of metrology in field of engineering, Standards andtypes of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error
PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:

(i) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw and screw nut method, compound gearing and helical spring methods.

(ii) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors.

(i) Principles of Electrical measuring Instruments.

(ii) Principles of Hydraulic and Pneumatic Instruments.

Unit 2:

Comparators

General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

Unit 3:

Surface Finish

Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

Unit 4

Various Types Of Instruments Used For:

1. (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer

2. Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only)

TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

Unit 5

Inspection of Geometrical Errors:

Construction and working of auto collimeter,checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod).

MAINTENANCE OF MEASURING INSTRUMENTS: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:

1. Metrology: RK Jain

2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments

UNIT 1

INTRODUCTION: Meaning and scope of metrology in field of engineering, Standards and types of measurements (Line and Wave, length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances, Interchangeability, precision and accuracy, Sources of error PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS: (a) Principle of Mechanical Measuring Instruments: Lever method, Vernier method, screw and screw nut method, compound gearing and helical spring methods. (b) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projectors. (c) Principles of Electrical measuring Instruments. (d) Principles of Hydraulic and Pneumatic Instruments.

UNIT 2:

COMPARATORS General principles of constructions, balancing and graduation of measuring instruments, characteristics comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, mechanical comparator, mechanical-optical, zeissoptotest, electro limit, electromechanical electronics, pneumatic comparators, gauges, tool makers microscope.

UNIT 3:

SURFACE FINISH Geometrical characteristics of surface roughness- Wavyness, layflaws, Effect of surface quality on its functional properties. Factor affecting the surface finish, Drafting symbols for surface roughness, Evaluation of surface finish RMS and CLS values, Methods of measuring surface roughness qualitative and quantitative methods, Comparison of surface produce by common production methods.

UNIT 4:

VARIOUS TYPES OF INSTRUMENTS USED FOR: (i) (a) Physical Measurements such as-Length, distance, height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement (b) Liquid Level & Viscosity-Liquid level measuring methods and devices, Viscometer - Plate and cone Viscometer, Two float viscometer, Rheo viscometer (ii) Mechanical Quantities: (a) Displacement. velocity, acceleration, space troque-Use of transducers and electronic count stroboscope, vibrating reeds and technometers (b) Pressure and Vacuum - Idea of atmosphere pressure, Gauge pressure and vacuum - Use of instruments such as manometers and those use elastic elements such as diaphragm, capsule Bellows, Bourdon tube and various transducers thermo couple, vacuum gauges (c) Strain - Use of Strain gauge and load cells (d) Mechanical Power - Dynomometers - absorption and transmission type both. (Reference Only) TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both)

UNIT 5

INSPECTION OF GEOMETRICAL ERRORS: Construction and working of autocollimeter, checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod). MAINTENANCE OF MEASURING INSTRUMENTS: Defects likely to occur in measuring instruments and their remedies. General maintenance of measuring instruments

Reference Books:

1. Metrology: RK Jain
2. Mechanical Measurement: RK Jain

Metrology and Measuring Instruments lab.

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto- collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

Machine Tool Technology Lab.

(A) MACHINE SHOP

1. (a) Square thread cutting (internal and external) - 2 jobs

   (b) Multi-start thread cutting - 1 job

   (c) Eccentric Turning - 1 job

2. Making utility job - Planner, Shaper, Slotter - 1 job
3. Group work on milling machine involving up & down milling in:

   (a)Gang milling - 1 job

   (b)Spur gear cutting - 1 job

   (c)Helical gear cutting - 1 j

(B) FITTING SHOP

1. To make a cut and cup tool - 1 job
2. To make blank and pierce tool - 1 job
3. To make a male and female fitting jobs - 1 job
4. To grind a lathe/shaper/planer tool - 1 job
5. To make different types of keys - 3 jobs
6. To make complete gauge - 2 jobs

Level 5 (Semester II)

Total Quality Management

1. Introduction, Basic concepts of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5–'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

General Mechanical Engineering - II

Unit 1:

Basics of Thermodynamics

Basic definition of heat, work, Thermodynamic process, parameters of working body and their units, Equation of state, Universal gas constant, Relation between heat capacity and temperature. Determination of quantity of heat

Unit 2:

Laws of Thermodynamics

Elementary concept of laws of thermodynamics, first law and second law, Graphical representation of process, The work of expansion and compression of a gas, Change in the state of ideal gas-Isochoric, Isothermal and Adiabatic process, Carnot-cycle

Unit 3:

IC Engines

External & internal combustion engines, working of diesel and petrol engine, horse power of IC engines

Unit 4:

Steam Generators & Condensers

Construction and working of Babcock & Wilcox boiler, Cochran boiler, Steam condenser & its types

Unit 5: Steam & Gas Turbines

Steam turbine, classification and principle of operation, gas turbine

Reference Books:

1. Basic Mechanical Engineering, M.P. Poonia& S.C. Sharma, Khanna Publishing House
2. Strength of Materials, D.S. Bedi, Khanna Publishing House
3. General Mechanical Engineering: Jk Kapoor
4. Mechanical Engineering: Khurmi& Gupta

Manufacturing Technology – II

UNIT I

GENERAL PROCESS: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility viz., Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking, Welding, Soldering, Brazing, Metal cutting processes-turning, Drilling, Boring, Shaping, Grinding, Elementary idea of machines used for the above processes.

WELDING: (a) Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as (i) Electric arc welding. (ii) Resistance welding. (iii) Thermit welding (iv) Carbon arc gauging. (v) Metal-Inert-Gas welding (MIG)

(vi) Tungsten Inert Gas welding (TIG) (vii) Atomic Hydrogen arc welding. (viii) Stud welding. (ix) Laser Beam, Electron Beam welding, Explosion welding (b) Welding Arcs: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes.

UNIT 2

WELDING OF SPECIAL MATERIALS: (a) Welding of plastics, equipment, filler rods, weldability, procedures and precautions. (b) Welding of Grey Cast Iron, shielded metal arc gas welding procedures. (c) Welding of Aluminium, Argon arc and gas welding procedures.

(d) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG, Oxy-acetylene method.

TESTING OF WELDS & RELEVENT WELDING CODES: (a) Destructive methods (b) Non-destructive methods-visual, X-ray, Y-ray, Magnetic particles, fluorescent, penetrant and ultrasonic testing.

UNIT 3 & UNIT 4:

FOUNDRY PRACTICE PATTERN & MOULDING: The pattern materials used, Types of pattern allowances and pattern layout, Colour scheme patterns defects, Types of cores and their utility. Moulding and Pouring: Classification of mould materials according to characteristics, Types of sands and their importance test, parting powders and liquids, Sand mixing preparation, Moulding defects MELTING AND POURING: Brief idea of refractory material and fluxes, Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, their construction and operation, metals and alloys. Additions to molten metal, Closing and pouring of the moulds, Coring-up, venting and closing, use of ladles, spur and risers, Defects due to closing and spurring, Basic idea of fettling operations. Surface treatment, salvaging of castings, Factors determining soundness of casting.

UNIT 5

FOUNDRY PRACTICE: Elementary idea of special casting Processes-Shell mould casting, die casing, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries

POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing, Self-lubricated bearings. Advantages of the process and its limitations (Elementary concept only)

Reference Books:

1. Workshop Technology, Vol. I: BS Raghuvanshi

2. Production Technology, Vol. I: Hazra& Chaudhry

Industrial Engineering

UNIT 1

INSPECTION: Inspection and its objective, Types of inspection, Inspection standards, Duties of inspection foreman QUALITY CONTROL: Concept of quality control, Elements of quality control, quality control groups, objectives of quality control. Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes, Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S (v) TQM system, concept & brief idea only .

UNIT 2:

WORK STUDY Method study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, gang process chart, Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion Study. Principles of human motion economy, Micro-motion study, Memo motion study, Therbligs, left hand and right hand chart.

UNIT 3:

CPM & PERT Introduction to CPM, language of CPM network, Diagram map for CPM chart, arrow diagram method of CPM, Programme Evaluation & Review Technique (PERT) Activity event network (simple manual cases only). Project scheduling with CPM & PERT

UNIT 4:

PLANT LAYOUT General Plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout. Advantages and disadvantages of process layout and product layout, GENERAL: Standardization, sources of standard, value of standardization. Production Planning & Control-Introduction, concept of planning, scheduling routing &dispatching and follow up functions, Need for Production, Planning and Control.

UNIT 5:

MATERIAL HANDLING Material Handling & material handling equipment, factors in material handling problems, cost reduction through improved material handling, Reduction in time of material handling, Material handling equipment-Idea about lifting lowering devices, Transportation devices, combination devices, Maintenance of material handling equipment.

Reference Books:

1. Industrial Engineering and Management, S.C. Sharma, Khanna Publishing House
2. Industrial Safety, S.C. Sharma, Khanna Publishing House
3. Industrial Engineering & Management: Banga, Sharma & Agrawal
4. Industrial Engineering Safety & Pollution (Hindi): HemendraDutt

Project

On the basis of learning in the vocational diploma, a project to be taken up by the student strengthening his/ her vocational skills

Engineering Graphics

1. Introduction

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP.Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2. Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

3. Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of Tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut Spheres.

Reference Books:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
4. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Mechanical Workshop Practice

1. SHEET METAL WORKING AND SOLDERING:
    a. (EX-1) Cutting, shearing and bending of sheet.
    b. (EX-2) To prepare a soap case by the metal sheet
    c. (EX-3) To make a funnel with thin sheet and to solder the seam of the same
    d. (EX-4) To make a cylinder and to solder the same

2. FITTING SHOP WORK:
    a. (EX-1) Hack sawing and chipping of M.S. flat
    b. (EX-2) Filing and squaring of chipped M.S. job
    c. (EX-3) Filing on square of rectangular M.S. Plate
    d. (EX-4) Drill a hole in MS Block & tapping the same
    e. (EX-5) Making a Bolt & Nut by Tap & Die set.

3. SMITHY SHOP WORK:
    a. (EX-1) To prepare square angular piece by M.S. rod
    b. (EX-2) To make square or hexagonal head bolt
    c. (EX-3) To make a screw driver with metallic handle
    d. (EX-4) To make ring with hook

4. Tin Smithy, Soldering, Brazing
    a. (EX-1) To prepare different types of joint such as lap joint single seam, double seam & cap joint-hem & wired edge.
    b. (EX-2) Utility article-waste paper basket or paper tray
    c. (EX-3) Study & sketch stakes / anvils.
5. WELDING SHOP WORK:
    a. (EX-1) Welding practice gas & electric arc welding
    b. (EX-2) Welding for lap joint after preparing the edge
    c. (EX-3) Welding Butt joint after preparing the edge
    d. (EX-4) Gas Cutting
    e. (EX-5) `T' joint welding after preparation of edge.

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Elements of Workshop Technology Vol. I: BS Raghuwanshi

Level 6 (Semester III)

Tool Engineering - I

Unit 1

Introduction:

Concept, meaning and definitions of tool, tool design and tool engineering, Tools-types, classification, features & applications, Tool engineering- functions and importance to enhance productivity and quality, Importance of process planning in tool engineering, Economy-concept, meaning, importance and principles in tool engineering.

Unit 2

Cutting tools: Cutting tool materials-types, composition, properties and applications, Carbide inserts-types, ISO-designation and applications, Re-sharpening methods of following cutting tools: i. Drill. ii. Side and face milling cutter. iii. End mill. iv. Centre drill etc.

Unit 3

Press tools: Press working processes-types, sketches and applications, Press tools: types, working, components and their functions, Concept, meaning, definitions and calculations of press tonnage and shut height of press tool, Shear action in die cutting operation, Centre of pressure: Concept, meaning, definition, methods of finding and importance, Die clearance: Concept, meaning, definition, reasons, effects and methods of application, Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization, Types, working, and applications of stock stop, pilots, strippers and knockouts, Cutting dies-types and applications.

Unit 4

Dies and moulds: Bending: Types, Parts and functions of bending die, Definition, calculations and factors affecting bend radii, bend allowance and spring back, Method to compute bending pressure, Types, sketch, working and applications of bending dies. Drawing dies-types and method to determine blank size for drawing operation, Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging), Forging dies- terminology, types, sketch, working and applications, Dies / Mould: Sketch, working and applications of following i. Extrusion. ii. Plastic injection. iii. Blow moulding

Reference Books:

1. Tool Engineering ,Albert A Dowd

Production Automation & Computer Integrating Manufacturing

UNIT 1-General: Automation-Definition, Scope, its types and their merits, reasons for automation, its appreciation and criticism, Meaning of the term Computer Integrated Manufacturing (CIM CAD/ CAM) Relationship between CIM and Automation FUNDAMENTALS OF MANUFACTURING AND AUTOMATION: Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Types of Production-Job shop production, Batch production Mass production (Quantity Production and Flow production).Manufacturing - Functions - Processing - Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations, Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view, Automation of welding Manufacturing Process Inputs - Raw materials, Equipments (Machine Tools), Tooling and fixtures, Energy and Labour, Outputs - Finished product and Scrape/Waste. Plant Layout - Its meaning and concept of fixed position layout, Process Layout, Product layout and Group technology layout, Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control

UNIT 2 -Production Concept: Such as Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems Automation Strategies and Their Effect - Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, computer integrated manufacturing. PRODUCTION ECONOMICS: Methods evaluation investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing, lead time and work in process.

UNIT 3Assembly System And Line Balancing:The assembly process, Assembly system, Manual assembly lines, Line balancing problems, Computerised line, balancing methods, Other ways to improve the line balancing, flexible manual assembly line AUTOMATED ASSEMBLY SYSTEMS: Design for automated assembly, Types of automated assembly systems, Parts feeding devices, analysis of multi-station Assembly machines, Analysis of single station assembly machines

UNIT 4:

Numerical Control Production System:Numerical controlling, Coordinate system, and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS

UNIT 5

N.C. Part Programming: Tape and Tape format, Methods of N.C. part programming, Computer assisted part programming, The APT Language, Manual data inputs, N.C. part programming using CAD/CAM and Computer automated part programming. DNC, CNC & ADAPTIVE CONTROL: Direct Numerical Control (DNC), Computer Numerical control (CNC), Adaptive Control Machining, Current trends in N.C., introductory idea of FMS (Flexible Manufacturing System)

Reference Books:

1. Numerical Control Machines: NK Mehta
2. Production Automation & Computer Integrated Manufacturing: MP Groover

Fundamentals of Mechatronics

1. Introduction: Introduction to mechatronics, systems, measurement systems, control systems, the mechatronics approach. Introduction to Transducers: Sensors and transducers, operating characteristics of transducers, measurement of displacement, velocity, pressure, flow, and temperature.

2. Signal conditioning: Signal conditioning- their features and various blocks, the operational amplifiers, Protection, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing. Data Presentation Systems: Displays, Data presentation elements, Magnetic recording, Displays, Data acquisition system, Telemetry- electrical, optical and pneumatic methods of telemetry.

3. Introduction to process control systems: Importance of process control, analog and digital processing, Supervisory digital control, direct digital control. Controller Characteristics: Process characteristics, control system parameters, Discontinuous controller modes (two position, multiple position, floating position), Continuous controller modes i.e. P, I, D, PI, PD, PID.

4. Introduction of Mechanical Actuation Systems: Mechanical Actuation Systems for motion, Kinematics chains, Cams, Gear trains, Belt and chain drives, Bearings. Pneumatic and Hydraulic Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Process control valves, rotary actuators.

5. Introduction of Electrical Actuation Systems: Electrical systems, Mechanical Switches, Solid-state switches, Solenoids, DC motors, AC motors, Stepper motors.

Reference Books:

1. Mechatronics: A Multidisciplinary Approach,by William Bolton
2. Mechatronic Systems: Fundamentals,by R. Isermann

Machining and Machine Tools

1. Classification of Metal Removal Process and Machines Mechanics of Metal Cutting: Geometry of single point cutting tool and tool angles, tool nomenclature in ASA, ORS, NRS and interrelationship, introduction of mechanism of chip formation and types of chips, chip breakers, orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting, thermal aspects of machining and measurement of chip tool interface temperature, friction in metal cutting.

2. Machinability: Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability, Cutting fluids, types, properties, selection and application methods, General Purpose Machine Tools: tooling, attachments and operations performed, selection of cutting parameters, Simple calculation of time for machining.

3. Special Purpose Machine Tools: Automatic lathes, capstan and turret lathe machines, tracer attachment in machine tools, mechanical-copying machines, Hydraulic tracing Devices, Electric tracing systems, Automatic tracing, Abrasive Processes: Abrasives, natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding, machines for surface and cylindrical grinding, their constructional details and processes, surface finishing, honing, lapping, super finishing, polishing and buffing processes.

4. Thread and Gear Manufacturing: Casting, thread chasing, thread cutting on lathe, thread rolling, die threading and tapping, thread milling, thread grinding, Gear Manufacturing Processes: Hot rolling, stamping, powder metallurgy, extruding etc. gear generating processes, gear hobbling, gear shaping, gear finishing processes, shaving, grinding, lapping, shot blasting, phosphate coating, gear testing.

5. High Velocity Forming Methods: (High-energy rate forming processes) Definition, Hydraulic forming, explosive forming, electro- hydraulic forming, magnetic pulse forming

Reference Books:

1. Machine Design, Sadhu Singh, Khanna Publishing House
2. Machine Design Data Book, Sadhu Singh, Khanna Publishing House

Tool Engineering Lab

1. Study of the influence of tool geometry on surface integrity

a. With positive rake angle b. With negative rake angle

2. Effect of speed, feed, depth of cut and nose radius on surface topography of the components machined using tool inserts

3. Cutting force measurement and construction of Merchant circle diagram as a function of rakeangle

4. Study of different type of chips

5. Tool tip temperature measurement during turning of heat treated and cast products

6. Machinability studies on different materials (for different conditions)

7. Machining of the heat treated samples

8. Machining of as-cast product

9. Measurement of tool wear of inserts due to machining

Mechatronics Lab

1. Displacement Measurement using Capacitive & inductive Pick –ups.
2. Study of Speed Measurement System: (a) Magnetic Pick-up (b)Stroboscope
3. Study of Load Measurement System Load Cell
4. Measurement of temperature using thermocouple, thermistor and RTD
5. Measurement of displacement using POT, LVDT & Capacitive transducer
6. Torque measurement using torque measuring devices
7. Strain Measurement using strain gauge
8. Frequency to Voltage Converter and vice versa
9. Position and velocity measurement using encoders
10. Study on the application of data acquisition system for industrial purposes

Level 6 (Semester IV)

Tool Engineering – II

Unit 1.

Tool holders: Tool holders for turning and milling carbide inserts-types, ISO-designation and applications, Tool holding and tool mounting systems for conventional milling and drilling machine tools.

Unit 2.

Locating and clamping devices: Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

Unit 3.

Clamping devices: Types, Sketches with nomenclature, Working, Applications

Unit 4.

Jigs and fixtures: Concept, meaning, differences and benefits of jigs and fixtures, Types, sketches with nomenclature, working and applications of jigs, Types, sketches with nomenclature, working and applications of fixtures.

Unit 5.

Design of Jigs and Fixtures: Steps in designing jigs and fixture for given simple component

Reference Books:

1. Tool Engineering BY Albert A Dowd

Lean and Agile Manufacturing

Unit 1.

Introduction- Introduction to Just in time production, Toyota production system, Introduction to lean manufacturing (LM), history of LM, advantages of LM over mass production

Unit 2.

Waste Identification- Types of wastes, lean manufacturing principles; Value, value stream, flow, pull and perfection

Unit 3.

Value stream mapping- Introduction to value stream mapping, types of value stream mapping, value added activities, necessary non value added activities, non-value added activities

Unit 4.

Lean manufacturing tools- Introduction to 5S, Kanban, kaizen, work standardization, Statistical process control, automation and other lean tools

Unit 5.

Agile manufacturing- Introduction to agile manufacturing, advantages of agile manufacturing, differences with lean manufacturing.

Reference Books:

1. Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities,Devadasan S.R
2. Learning Agile: Understanding Scrum, XP, Lean, and Kanban,Andrew Stellman, Jennifer Greene

Metal Forming Processes

Unit 1.

Rolling- Introduction, Types of rolling, Hot rolling, Two high reversing mill, Three high mill, Continuous mill, Roll bending

Unit 2.

Forging- Introduction, Advantages of Forging, Application of Forging, Limitations of Forging, Upsetting, Hollow Forging, Impression die or closed, Methods of Forging, Drop Forging, Press Forging, Hammer and press Forging, Hot bar Forging, Upset Forging

Unit 3.

Extrusion- Direct and forward, Sleeve method of direct, Indirect or backward, Impact Extrusion, Tube Extrusion, Stepped Extrusion, Combined forging and Extrusion

Unit 4.

Drawing- Wire Drawing, Cupping and Bending, Tube Drawing, Spinning, Hot and cold Spinning Advantages of Metal Spinning

Unit 5.

Pipe and Tube Production- Manufacturing of seamless pipe- Butt welded pipe- Lap welded pipe

Reference Books:

1. Sheet Metal Forming Processes: Constitutive Modelling and Numerical Simulation,D. Banabic
2. Metal Forming Processes ,G. R. Nagpal

Mass Production Devices

Unit 1.

Introduction- Properties of tool material, types of tool material, 5 basic requirement of tool material and general consideration in tool design, Tools-types, classification, features & applications

Unit 2.

Design of Cutting Tools- Geometry and features of Single point tool, Boring tool, Twist Drill, Milling cutter, Broaches.Carbide inserts-types, ISO-designation and applications.

Unit 3.

Press Tools- Introduction to Press tools, Elements of press tools - punches, punch holder, knockouts, pilots stock, Types of punches, Standards die sets, Element of blanking die, Element of drawing die, Element of bending die, Working of progressive and compound dies

Unit 4.

Jig & Fixtures-I- Usefulness, Principles of Jig & Fixtures design, Principle of location, Locating and clamping devices 5. Jig & Fixtures-II- Type of jigs, Element of a fixture, Milling fixtures, Lathe fixture, Economics of jigs and fixtures

Reference Books:

1. Mass Production, phaidon

Tool & Die Making Lab

1. Manufacture of Box Jig and Angle plate jig
2. Manufacture of “V” Block angle grinding Fixtures and profile milling fixture
3. Manufacture of simple Blanking & piercing Tool
4. Manufacture of Progressive tool for producing a Cycle chain link
5. Manufacture of Press tools like Combination tool & Compound tool
6. Manufacture of Draw tool
7. Trial out On Fly press and power press the Produced components such as V, U, Cycle link, Cup, Washer and Cycle bell cup
8. Manufacture of simple V and U bending tool
9. Maintenance of Jig& fixture and press tool

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

Level 7 (Semester I)

Reliability, Maintenance and Safety

Engineering

Unit 1

Reliability- Definition, reliability function, Mean failure rate, mean time to failure (MTTF), mean time between failures (MTBF), hazard rate curve. Bathtub curve, Conditional Reliability

Unit 2

Constant Failure rate model- Exponential Reliability function, Failure Modes, CFR model, memory lessens, System reliability: Series, parallel, mixed & complex configuration; Reliability improvement.

Unit 3

Design for reliability- Reliability specifications and system Measurements, System Effectiveness, redundancy, Classification of Redundancy. Introduction of failure mode and effect analysis (FMEA)

Unit 4

Maintainability- Analysis of Downtime, repair time distribution, stochastic point processes.

Unit 5

Safety engineering- Fundamentals of industrial safety, Safety policy and safety terminology, Different types of safety systems and equipments, Safety targets, standards, objectives.

Reference Books:

1. Reliability Engineering, S.C. Sharma, Khanna Publishing House
2. Reliability, Maintenance and Safety Engineering,A.K. Gupta

Design Concepts in Engineering

1. Design Fundamentals: Importance of design- The design process-Considerations of Good Design – Morphology of Design –Organization for design– Computer Aided Engineering – Designing to codes and standards – Concurrent Engineering – Product and process cycles – Technological Forecasting – Market Identification – Competition Bench marking.

2. Customer Oriented Design & Societal Considerations: Identification of customer needs- customer requirements- Quality Function Deployment- Product Design Specifications- Human Factors in Design – Ergonomics and Aesthetics. Societal consideration - Contracts – Product liability – Protecting intellectual property – Legal and ethical domains – Codes of ethics - Ethical conflicts – Environment responsible design-future trends in interaction of engineering with society.

3. Design Methods: Creativity and Problem Solving –Creativity methods-Theory of Inventive Problem Solving (TRIZ)–Conceptual decomposition-Generating design concepts-Axiomatic Design – Evaluation methods-Embodiment Design-Product Architecture-Configuration Design- Parametric Design. Role of models in design-Mathematical Modelling – Simulation – Geometric Modelling –Rapid prototyping-Finite Element Analysis– Optimization – Search Methods

4. Material Selection Processing and Design: Material Selection Process – Economics – Cost Vs Performance – Weighted property Index – Value Analysis – Role of Processing in Design – Classification of Manufacturing Process – Design for Manufacture – Design for Assembly–Designing for castings, Forging, Metal Forming, Machining and Welding – Residual Stresses – Fatigue, Fracture and Failure.

Reference Books:

1. Design concepts for engineers,Mark N. Horenstein
2. Concepts in Engineering Design,Sumesh Krishnan, Dr.Mukul Shukla

Product Design and Development

Unit 1.

Importance of New Product: Definition-importance-Development Process, Importance of new product for growth of enterprise, Definition of product and new product, Responsibility for new product development, Demands on product development team, Classification of products from new product development point of view. New product development process and organization, Generic product development process for Market Pull Products, Modification of this process for other types of products.

Unit 2.

Need Analysis: Problem formulation establishing economic existence of need, need identification and analysis, engineering statement of problem, establishing target specification

Unit 3.

Generation of Alternatives and Concept Selection: Concept generation- a creative process, Creativity, Road Elects to creative thinkingFear of criticism and Psychological set, Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process, Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.

Unit 4.

Preliminary and Detailed Design: Design Review Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility, Detailed design of subsystems, component design, Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.

Unit 5

Assembly drawing and review
Preparation of assembly drawings, Review of product design from point of view of Manufacturing, Ergonomics and aesthetics

Reference Books:

1. Manufacturing Processes for Design Professionals, Rob Thompson
2. Product design for manufacture and assembly, Geoffrey Boothroyd

CAD & CAM

Unit 1

Introduction CIM and CAD & Analysis:

CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

Unit 2

Computer aided Manufacturing CAM:

Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

Unit 3

CNC Machine and Components:

CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

Unit 4

Part Programming

NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

Unit 5

FMS, Integrated Material Handling and Robot:

Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House

2. Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

CAD Lab

1. Introduction and different features of the CAD Software.
2. 2-D Drafting.
3. 3-D Modeling.
4. 3-D Advanced Modeling.
5. Assembly modeling.
6. Feature Modification and Manipulation
7. Detailing.
8. Sheet Metal Operations.
9. Surface Modeling.

CAM Lab

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation

Level 7 (Semester VI)

Rapid Prototyping and Reverse Engineering

Unit 1

Introduction

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

Unit 2

CAD Modelling and Data Processing for RP

CAD model preparation, Data Requirements, different types of Data formats, Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation.

Unit 3

RP Systems

Photo-polymerization process, Powder Bed Fusion process, Applications of Powder Bed Fusion Processes. Extrusion - Based RP Systems, 3D Printing process modelling, Applications of Printing Processes. Sheet Lamination process /Laminated Object Manufacturing (LOM), Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing - structure-properties, relationships, Benefits and drawbacks.

Unit 4

Rapid Tooling:

Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Unit 5

RP Applications:

Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP

Reference Books:

1. Rapid Product Development, Kimura Fumihiko

Process Planning and Cost Estimation

Unit 1. Introduction to Process Planning: Process Planning—Definition, Purpose of Process Planning, Concept of Process Planning, Objectives of Process Planning, Scope of Process Planning, and Information required to do Process Planning, Preparing Operation Planning Sheet

Unit 2. Process Planning activities: Process Planning Procedure, Approaches of Process Planning, Manual Process Planning, Computer Aided Process Planning, Factors Affecting Selection Process, Machine Capacity, Determination of Man, Machine and Material Requirements, Factors Influencing Choice of Machinery

Unit 3. Introduction to Cost Estimation: Reasons for doing Estimates, Importance of Estimating, Objectives or Purpose of Estimating, Functions of Estimating, Cost Accounting of Costing, Importance of Costing, Aims of Cost Accounting, Difference between Cost Estimating and Cost Accounting, Cost of Product (Ladder of Cost) Production Cost Estimation, Determination of Material Cost, Mensuration in Estimating

Unit 4. Machining Time Calculation: Selection of Cutting Speed, Feed and Depth of Cut for Turning: Machining Time Calculation for Turning Operation. Selection of Cutting Speed, Feed and Depth of Cut for Milling Operation: Machining Time Calculation for Milling Operation. Selection of Cutting Speed, Feed Depth of Cut for Drilling Operation: Machining Time Calculation for Drilling Operation

Reference Books:

1. Process Planning And Cost Estimation,Panneerselvam R., Sivasankaran P.
2. Process Planning and Cost Estimation, B. Vijayaramanath, C.Elanchezhian, R.Kesavan

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc

Refrigeration and Air conditioning(RC)

Branch Code:105

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

Evaluation Scheme
B. Voc Refrigeration and Air conditioning

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV511	Basics of Refrigeration	30	10	5	5	20	30		50	2
2	BRCV512	Basics of Air Conditioning	30	10	5	5	20	30		50	2
3	BRCV513	Engineering Material	30	10	5	5	20	30		50	2
4	BRCV514	Soldering & De-Soldering of Components & Emergency actions	30	10	5	5	20	30		50	2
5	BRCP511	Metrology and Measuring Instruments Lab	30				20		30	50	1
6	BRCP512	Heat Transfer lab.	30				20		30	50	1
7	BRCP513	Language Lab	30				20		30	50	2
8	BRCT511	Field Technician- AC (ELE/Q 3102)						Any one Training 400 hrs/ 8 weeks		150	12
	BRCT512	Field Technician- Refrigeration (ELE/Q 3103)									
	BRCT513	Field Engineer- RACW (ELE/Q3105)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV521	Industrial Management	30	10	5	5	20	30		50	2
2	BRCV522	Total Quality Management	30	10	5	5	20	30		50	2
3	BRCV523	Entrepreneurship	30	10	5	5	20	30		50	2
4	BRCV524	Refrigeration & Air Conditioning Applications	30	10	5	5	20	30		50	2
5	BRCP521	Project -1	30				20		30	50	1
6	BRCP522	Basic Electrical and Electronics Lab	30				20		30	50	1
7	BRCP523	IT Tools Lab	30				20		30	50	2
8	BRCT521	Field Technician- AC (ELE/Q 3102)						Any one Training (other than 1st sem) 400 hrs/ 8 weeks		150	12
	BRCT522	Field Technician- Refrigeration (ELE/Q 3103)									
	BRCT523	Field Engineer- RACW (ELE/Q3105)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV631	RAC Piping Systems - I	30	10	5	5	20	30		50	2
2	BRCV632	Refrigeration & Air-conditioning Material -I	30	10	5	5	20	30		50	2
3	BRCV633	Refrigerants	30	10	5	5	20	30		50	2
4	BRCV634	RAC Standards	30	10	5	5	20	30		50	2
5	BRCH631	Uni. Human Values & ethics/Env. &Eco.	30	10	5	5	20	30		50	2
6	BRCP631	RAC Material Lab	30				20		30	50	1
7	BRCP632	RAC Systems Installation and its Maintenance Lab. - I	30				20		30	50	1
8	BRCT631	Safety Tester – RACWO (ELE/Q3605)					Any one Training 400 hrs/ 8 weeks			150	12
	BRCT632	Field Engineer – RACW (ELE/Q3105)									
	BRCT633	Cold Storage Technician (FIC/Q7004)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV641	RAC Piping Systems - II	30	10	5	5	20	30		50	2
2	BRCV642	Refrigeration & Air-conditioning Material-II	30	10	5	5	20	30		50	2
3	BRCV643	RAC Maintenance - I	30	10	5	5	20	30		50	2
4	BRCV644	RAC Installation Techniques - I	30	10	5	5	20	30		50	2
5	BRCH641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BRCP641	RAC Systems Installation and its Maintenance Lab. - II	30				20		30	50	1
7	BRCP642	RAC Piping Systems Lab	30				20		30	50	1
8	BRCT641	Safety Tester – RACWO (ELE/Q3605)					Any one Training (other than 3rd sem) 400 hrs/ 8 weeks			150	12
	BRCT642	Field Engineer – RACW (ELE/Q3105)									
	BRCT643	Cold Storage Technician (FIC/Q7004)									
Total			610							500	24

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV751	RAC Maintenance - II	30	10	5	5	20	30		50	2
2	BRCV752	RAC Installation Techniques - II	30	10	5	5	20	30		50	2
3	BRCV753	Automobile Air conditioning	30	10	5	5	20	30		50	2
4	BRCV754	Non-conventional Refrigerating System	30	10	5	5	20	30		50	2
5	BRCH751	Indian Constitution / Essence of Indian Traditional knowledge	30	10	5	5	20	30		50	2
6	BRCP751	RAC Maintenance - II	30				20		30	50	1
7	BRCP752	RAC Installation Techniques - II	30				20		30	50	1
8	BRCT751	AC Specialist – Automobile (ASC/Q 1416)					Any one Training 400 hrs/ 8 weeks			150	12
	BRCT752	Assembly Operator (ELE/ Q 3501)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BRCV761	RAC Safety	45	10	5	5	20	30		50	2
2	BRCV762	Process Planning and Cost Estimation	45	10	5	5	20	30		50	2
3	BRCH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BRCP761	Major Project	180						150	150	6
5	BRCT761	AC Specialist – Automobile (ASC/Q 1416)				Any one Training (other than 5th sem) 400 hrs/ 8 weeks				200	12
	BRCT762	Assembly Operator (ELE/ Q 3501)									
Total			610							500	24

V: General Vocational; P: Vocational Practical; T: On Job Training; SSC: Sector Skill Council

Level 5 (Semester 1)

Bridge Course

Steam Generators: Types of steam generators - Fire tube, water tube boilers, boiler mountings and accessories, Equivalent evaporation, boiler efficiency, elements of power plant.

Reciprocating Steam Engines: Working principles, classification, a brief idea and concept only.

Steam Turbines: Classification, principle of operation of Impulse reaction steam turbines.

Steam Condensers: Principle of operation, classification, a brief concept, condenser details, applications

Air Compressors: Definition and their use, Difference between reciprocating and rotary compressors, their types and working, Inter cooling in two stage compression volumetric efficiency, Compressor lubrication. Simple numerical problems.

Basic Thermodynamics: Definition, concept of thermodynamic system and surroundings, closed system, open system, isolated system thermodynamics, definition of work, Zeroth law of thermodynamics, First law of thermodynamics for cyclic and noncyclical processes, Idea of internal energy and enthalpy, Applicability of first law on various thermodynamics processes, simple numerical problems.

Steady state flow process, its equation and its applications: Second law of thermodynamics, Thermodynamics concept of perpetual motion machine of first order and that of second order, Concept of heat engine, heat pump and refrigerator, Carnot cycle efficiency for heat engine and C.O.P for refrigerator and heat pump, Entropy: Its physical concept and significance.

Basics of Refrigeration

Unit 1

INTRODUCTION: Its meaning and application, unit of refrigeration; Various methods of refrigeration.

Unit 2

REFRIGERATION SYSTEMS: Refrigeration Cycles: Refrigeration, carnot cycle of refrigeration (ideal cycle), Bell-Coleman cycle of refrigeration, their COP and Conditions for its highest value, Temperature limitations. Representation of these cycles, in P-V, T-S and P-H diagrams and also their flow diagrams, Simple numerical problems .

Unit 3

Vapour compression system: Standard vapour compression cycle, wet and dry compression, Effect of sub cooling and super heating, Effect of temperature and pressure on COP of the cycle. Simple numerical problems with the help of P-H diagram. Concept of house hold refrigerator working on vapour compression cycle.

Unit 4

Vapour Absorption System: Cycle of operation, Construction and working of refrigerator based on this system. Simple numerical problems (Simple line diagram)

Unit 5

REFRIGERANTS: Definition, classification & properties of few important refrigerants such as Ammonia, Sulphur-Di-Oxide (SO_2) Carbon-Di-Oxide (CO_2) Freon -12 (F-12) F-11. Qualities of good refrigerants, secondary refrigerant .

Suggested Reading:

Refrigeration and Air Conditioning: A Sarao

Refrigeration and Air Conditioning: RS Khurmi

Basics of Air Conditioning

Unit 1

INTRODUCTION: Its meaning and general application. Psychrometry: Definition, Composition of air, Daltons law of partial pressure, Gas and Vapour mixture, Dry and Wet bulb temperature, Wet bulb depression, Dew point, Dew point depression, Saturated air,

Unit 2

Specific humidity, Degree of saturation, Relative humidity, Absolute humidity, Humid specific volume and humid specific heat, Enthalpy of moist air,

Unit 3

Use of psychometric charts and tables, Sensible heating and cooling, Humidification and dehumidification and their methods, Simple numerical problems concerning above

Unit 4

HEAT LOAD: Brief idea of various types of heat loads, Sensible and latent heat loads. Sensible hat factor

Unit 5

ROOM AIR CONDITIONING: Brief idea of room air conditioning, Window types packaged air conditioner. Central air conditioning system, Round the year air conditioning

Suggested Reading:

Refrigeration and Air Conditioning: A Sarao
Refrigeration and Air Conditioning: RS Khurmi

Engineering Material

UNIT 1

ELECTRICAL ENGINEERING MATERIALS

Conducting Materials: Properties of good conducting materials, Brief idea about conductivity & Resistivity

UNIT 2

(a) Insulating Materials: (a) Plastic insulating materials-definition and classification, thermo-setting and thermoplastic materials, their applications and commercial names & uses in industry. (b) Various insulating materials-mica asbestos, ceramic materials, glass, cotton, silk, jute, paper their properties and applications

(B) Semiconductor Materials: Characteristics and applications of semiconductor materials

UNIT 3

(A) Non-Metallic Materials-Timber. Preservation of timber, Defects of timber, Surface treatment, Plywood, Hard Board, Batten Board, Veneer board, units of purchase

(B) Miscellaneous Materials: Important properties, characteristics and use of the following materials: Abrasives, Asbestos, Celluloid, Cork, Mica, Refractory

UNIT 4:Mechanical Engineering Materials

Non-Ferrous Metals: Aluminium, Zinc, Copper, Tin, Silver, Lead - Trade names; Physical, mechanical, and electrical properties and use

(ii) Base metal with principal alloying elements - Aluminium Alloys, Copper Alloys, Nickel Alloys, Bearing Metals- Lead base alloys, Tin base alloys, (White metals or babbitt metals), Copper base alloys.

UNIT 5: Civil Engineering Materials

General idea of raw materials, properties and uses of Bricks, lime, cement

Foundation: (i) Bearing capacity of soil and its importance, need of foundation for machines (ii) Foundations for heavy, light and vibrating machines (iii) Concrete proportion, mixing w/c ratio, workability RCC and its use.

Suggested Reading:

Engineering Materials: DhanpatRai& Sons

Electrical Engineering Materials: Madan Publishers

Soldering & De-soldering components & Emergency actions

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

2. Introduction to SMD Components
   - Identification of 2, 3, 4 terminal SMD components
   - Soldering the SMD components on the PCB
   - Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
   - Identify various connections and the setup required for SMD soldering station
   - De solder the SMD components from the given PCB
   - Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
   - Make a panel board using different types of switches for a given application
   - Identification of crimping tools for various IC packages
   - Reliable Soldering Practices

3. Emergency actions
   - Minimum Requirements

Metrology and Measuring Instruments lab.

1. Measurement of angle with the help of sine bar/ Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto-collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slop gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by polar planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters

Heat Transfer Lab.

Experiments on Conduction

1. Determination of Thermal conductivity of insulation powder
2. Determination of overall heat transfer coefficient of Composite Wall
3. Determination of overall heat transfer coefficient of Lagged Pipe
4. Determination of Thermal Conductivity of given Metal Rod

Experiments on Convection

5. Determination of heat transfer coefficient of Pin-Fin (Natural and Forced Convection)
6. Determination of heat transfer coefficient of Natural Convection
7. Determination of heat transfer coefficient of Forced Convection.

Experiments on Radiation

8. Determination of Stefan Boltzman Constant
9. Determination of Emissivity of test plate

Experiments on Applications of heat transfer and heat transfer with phase change

10. Determination of effectiveness and overall heat transfer coefficient using Parallel and Counter flow Heat Exchanger
11. Determination of heat transfer coefficient in drop and film wise condensation
12. Determination of Critical Heat flux
13. Study of heat pipe and its demonstration

Level 5 (Semester II)

Industrial Management

Unit -1. Introduction:

Growth of industry, The management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

Unit-2. Private sector and public sector:

Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

Unit-3. Wages & incentives:

Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.

Unit-4.Labour, industrial & tax laws:

Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Unit-5. Material management:

Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards

Total Quality Management

Unit-1. Introduction, Basic concepts

of total quality management

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

Unit-2. Continuous process improvement

Input /output process Model, Juran trilogy, PDCA Cycle, 5 –'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

Unit-3. Management planning tools & Bench marking

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

Unit-4. Just in time (JIT)

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban& 2 Bin Systems

Unit-5. Total productive maintenance (TPM)

Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Entrepreneurship

Unit 1. Entrepreneurship

and entrepreneur:

Need of Employment and Opportunities, Essential Characteristics of a good Entrepreneur, Industrial Policy, Classification of industries- Micro, small scale , Medium scale, Large scale, Type of industries- Production, Job based & Service

Unit 2. Entrepreneurial Development:

Product identification/ selection, Site selection, Plant layout, Institutional support needed, Pre-market survey.

Unit 3. Entrepreneurship Support System and Start-ups:

Introduction to start-up's, Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMML, Role of state finance corporation, state electricity corporations, pollution control board, BIS, I.S.O. etc.

Unit 4. Introduction to Tax System, Insurance and Acts:

Idea of income tax, sales tax, excise duty and custom duty, Industrial and fire insurance, procedure for industrial insurance, Introduction to Industrial acts, factory act, Workmen's compensation act 1923, Apprentices act 1961, Environmental protection act 1986.

Unit 5. Project Report Preparation:

Procedure of preparing a project report, Format of project report, Preparation of project report, Introduction to ISO: 9000 Series of Quality System

Refrigeration & Air Conditioning Applications

Unit I: Food Preservation

Introduction, factors contributing to food spoilage, causes of food spoilage, methods of food preservation, freezing method of food preservation, preservation of food with direct contact of liquid N2, freeze drying, preservation of different products, cold storage and commercial cabinets.

Unit II: Commercial Applications

Introduction, air-conditioning of houses, offices, hotels and restaurants, air-conditioning ofdepartmental stores, air-conditioning of theatres and auditoriums, hospitals and medical applications

Unit III: Ice-Manufacturing

Introduction, principles of ice production, different methods of ice manufacturing, treatment of water for making ice, brines, freezing tanks, ice cans, quality of ice

Unit IV: Industrial Applications

Introduction, importance of RH in different industries, ice-cream manufacturing, refrigeration for breweries, selection of refrigerant for breweries, use of liquid N2 for fabric, quality, air conditioning in textile and photographic industries

Unit V: Transport Air Conditioning

Introduction, automobile air conditioning, railway air-conditioning, marine air conditioning, aircraft air conditioning

Recommended books:

1. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
2. course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi

Reference books:

1. Refrigeration and Air Conditioning by C.P.Arora, McGraw Hill education (India) (P) limited, New Delhi
2. Principles of Refrigeration by Roy J. Dossat, Pearson education, New Delhi

Project -1

On the basis of learning and skill acquired in the academic year, a project to be taken up by the student strengthening his/ her vocational skills

Basic Electrical and Electronics Lab

Basic Electrical – Practicals

Verify that resistance of conductor is directly proportional to resistivity and length and inversely proportional to cross- sectional area of the conductor.

2. Verification of Ohm's Law.
3. Verification of temperature co-efficient of resistance:
(i) Positive for Tungsten and Nichrome and
(ii) Negative for carbon.
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Study of series and parallel connection of cells in circuits.
7. Preparation of Electrolyte for lead acid battery and its charging and measurement of Specific gravity with the help of hydrometer.
8. To find heat efficiency of an electric kettle.
9. Charging and Discharging of a capacitor.
10. Verification of magnetic field of a Solenoid with:
(i) Iron core and
(ii) Air core.
11. Verification of Faraday's Laws of electromagnetic induction.
12. Verification of Torque development in a current carrying coil in magnetic field.
13. Study of R.L. series circuit and measurement of power and power factor.
14. Study of R.C. series circuit and measurement of power and power factor.
15. Study of R.L.C. series circuit and measurement of power and power factor.
16. Study of R.L.C. series circuit for calculation of inductive reactance, capacitive reactance, impedance and Q- Factor.

Basic Electronics – Practicals

1. Study of current and voltage measurement using Ammeter and Voltmeter.
2. Study of current and voltage measurement using Galvanometer.
3. Study of current, voltage and resistance measurement using of Multi-meter
4. Study of Power and Energy measurement using Wattmeter and Energy meter.
5. Study of working principle of Signal Generator and measurement of amplitude, time period and frequency of signal using Oscilloscope.
6. Study of V-I Characteristic of Diode.
7. Study of V-I Characteristic of Zener Diode. And use of Zener Diode as voltage regulator.
8. Study of Half wave rectifier with and without filter circuit.
9. Study of Full wave rectifier with and without filter circuit.
10. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
11. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
12. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.
13. Study of working of single layer PCB manufacturing
14. Study of working of double layer PCB manufacturing.
15. Design of 7 segment display using LED and bread board.

Instruments Required (Electrical)

- Trainer kit for verifying ohm's law,
- Trainer kit for measuring TCR
- Lead acid battery,
- Hydrometer,
- Electric kettle
- Trainer kit for measuring power and power factor in RLC circuits

Instruments Required (Electronics)

- Ammeter
- Voltmeter,
- Multi-meter,
- Galvanometer,
- Energy Meter,
- CRO,
- Diode Trainer kit
- Zener diode Trainer kit
- Rectifier trainer kit
- Transistor characteristics trainer kit,
- PCB manufacturing Lab
- Bread board trainer kit to design 7 segment displays.

Level 6 (Semester III)

RAC Piping Systems – I

Bridge Course
Basic understanding Engineering Drawing

Unit I
Codes, Standards and Specifications: Piping codes, ASME codes and standards, ASTM Specifications,

Unit II
ASME Boiler, Pressure vessel codes, ASME B31-Code for pressure piping, mechanical strength, testing of piping system and valves, fabrications.

Unit III
Piping Components: Pipe-seamless, welded pipes, pipe sizes, dimensional specifications, material, specifications, pipe ends, pipe fittings, pipe support,

Unit IV
valves–gate valve, globe valve, check valve, ball valve, plug valve, butterfly valve, control valve, pressure relief valve, valve, codes and standard, valve size, pressure class rating.

Unit V
Viscosity, Reynolds number, friction factor, Darcy Weisback friction factor, friction factor for laminar and turbulent flows, equivalent pipe length, hydraulic radius, compressible, flow,

Recommended Books

1. Piping and Pipeline Calculations Manual by J. Phillip Ellenberger
2. The fundamentals of piping design by Peter Smith.

Reference Books:

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore.
2. ASHRAE handbook, 2002

Refrigeration & Air-conditioning Material – I

Unit I

Introduction, desired properties of ideal insulating material, factors effecting the thermal conductivity,

Unit II

types of insulating material., reflective insulating blinds, laprock – a thermal acoustic and fire insulation, natural insulator, new transparent heat insulator, heat transfer through insulation used for A.C,

Unit III

thickness of insulation, few insulated systems, low temperature insulations, importance of relative humidity for the selection of the insulations, air distribution for reducing heat lose.

Unit IV

Cables and Wiring: Cryocables, economics of cryocables, A.C. super conducting cables, liquid N2 cooled cables, Liquid H2 cooled cables, super magnet, electric generator, minimal insulated cables, installing cables

Unit V

Component Material: Refrigeration component material, duct material, material used in evaporator, material used in compressor, material used in condenser.

Refrigerants

Unit I

Introduction: Refrigerants, cooling media and liquid absorbents, azeotropic and zeotropic, numbering of refrigerants.

Unit II

Classification and Properties of Refrigerants: Requirement for refrigerant, classification-based on working principle, safety and chemical composition, desirable properties of refrigerants-thermodynamic properties, safe working properties, physical properties etc

Unit III

Choice of Refrigerant: Important refrigerants, secondary refrigerant, anti-freeze solution, selection of refrigerant for required purpose,

Unit IV

Application of Refrigerants: refrigerant oils and applications, Properties and uses of commonly used refrigerant

Unit V

Greenhouse effect, Global warming, Future Refrigerants like Hydrofluoro-Olefines

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi

Reference books

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore
2. Refrigeration and Air Conditioning by P.L.Ballaney, Khanna publishers, New Delhi

Modern Refrigeration and Air Conditioning by Andrew D. Althouse, Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC

RAC Standards

Unit I

Introduction: Meaning of IS, need of IS, international classification of standards for refrigeration and air conditioning, various national and international standards for heating, ventilation and air conditioning

Unit II

Procedure of standard development, levels of standard, main standardization, organizations, i.e. ISO-international organization for standardization, IEC-international electro technical commission and others international and national organizations

Unit III

Existing Standards: Main technical standards relevant to HCFC phase-out and low GWP (Global Warming Potential) alternatives, ISO, IEC, ECS (European Committee for Electrical Technical Standardization)

Unit IV

Adoption of International Standards at National Level: National standardization bodies, national ozone units, accreditation bodies, national RAC associations, the process of adoption

Unit V

Use of International Standards: In designing of refrigeration and air conditioning equipment, selection of materials related to refrigeration and air conditioning, safety issues related to refrigeration and air conditioning, industrial and field applications.

Recommended books

1. International Standards in Refrigeration and Air Conditioning , UNEP (United Nations Environment Program)
2. Refrigeration and Air Conditioning data book, New Age International Publication

Reference books

1. ISHRAE standard book for Refrigeration and Air Conditioning
2. ASHRE hand book for Refrigeration and Air Conditioning

RAC Materials Lab

Any eight of the following practical should be performed and recorded in laboratory book

1. Identification of types of copper tubes (dia. 3 mm, 6 mm, 12.5mm)
2. Identification of types of brazing road and its composition
3. Identification of oil and grease removals, fire hazard of the removals
4. Familiarization of joining material, gasket, pipe joint
5. Introduction of various insulating material, properties, fire hazard, etc.
6. Soldering and Brazing – types of brazing, preparation, purging. applying flux, applying heat.
7. Pipe Bending – Introduction to tools and different bends, pipe cutting.
8. Electrical requirement – introduction and familiarization with electrical symbols, circuit diagram of the RAC system
9. Introduction to gas welding set, simple gas welding, arc welding
10. Identification and testing of resistor, diodes and transistors
11. Identification of refrigerant cylinder by color coding and standing pressure – types of cylinder
12. Technique of glass wool filling method in conventional refrigerant.

RAC Systems Installation & Maintenance Lab. – I

1. Handling, use and familiarization with refrigeration tools and accessories such as: (a) Tube cutter (b) Tube bender [spring type] (c) Flaring tool (d) Swaging tool (e) Pinch off tools (f) Service valve wrench (g) Service valve (h) Adjustable wrench (i) Spanner set (j) Allen Key (k) Gauges (l) Blow lamp (m) Service cylinder (n) Gauge manifold (o) Wheel puller (p) Vacuum pump (q) Halide torch (r) Practicing of related operations.
2. Study of the following units: (a) Domestic refrigerator (b) Water cooler (c) Room Air conditioner (d) Evaporative cooler (e) Experimental ice plant.
3. Experimental ice plant.
4. Study of the following components and controls: (a) Compressor: open type and sealed types (b) Thermostatic expansion valve (c) Surface condenser (d) Different types of evaporators (e) Solenoid valve (f) Thermostat for refrigeration (g) H.P. and L.P. cut out (h) Gil safety switch (i) Strainers and driers.

Level 6 (Semester4)
RAC Piping Systems – II

Unit I
Pipe Size Calculations: Pipe sizing, pipe sizing formulae, pipeline wall thickness calculation, elements of total dynamic head–static head, pressure head, velocity head, friction head, Pump power required, Cavitations in pumps, NPSH required and NPSH available for pumps.

Unit II
Pipe Stress Analysis: Objectives and definition of stress analysis, piping loads, piping stresses-primary, secondary, pipe span, calculations flexibility analysis–expansion loops and expansion joints, concept of thermal expansion, providing flexibility in piping

Unit III
Assembly and Erection: Fabrications materials for piping systems, fabrication drawings, fabrication processes, Assembly-alignment, flanged joints, threaded joints,

Unit IV
Piping System Testing: Examinations methods, visual examination, magnetic particle examination, Liquid penetrant examination, radiographic examination, ultrasonic examinations,

Unit V
Testing–leak, test, preparation for leak test, hydrostatic leak test, pneumatic leak test, sensitive leak test, examination of welds

Recommended Books
3. Piping and Pipeline Calculations Manual by J. Phillip Ellenberger
4. The fundamentals of piping design by Peter Smith.

Reference books:
2. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore.
3. ASHRAE handbook, 2002

Refrigeration & Air-conditioning Material – II

Unit I

Component Material: Material used in expansion valve, different type of valve material

Unit II

Material used in cooling towers, pipeline materials, drying materials, jointing, material, synthetic repair materials.

Unit III

Oils and Lubrication: Need of lubrication, types of lubrication, properties of lubrication oils, lubrication systems

Unit IV

Selection of refrigerant lubricant, compatibility of lubricant with refrigerant fluidrefrigeration oil with additives, the effect of refrigerant on lubricant density, solvent and cleaning.

Unit V

Tubing: Soft copper tubing, hard-drawn copper tubing, steel tubing, normal size copper tubing, Cutting tubing, bonding tubing, connecting tubing, flaring tubing.

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C.Arora and S.Domkundwar, Dhanpatrai and sons, Delhi

Reference books

1. Modern Refrigeration and Air Conditioning by Andrew D. Althouse,Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC

RAC Maintenance – I

Unit I

RAC Tools: Engineering hand tools: spanners, screwdrivers, pliers, hammers, brazing, welding, flaring tool, tube bender, hammer, wrenches, shock wrenches, files, hacksaws, wood saws, electrical hand drill, sheet metal snips, Allen keys pop riveter, chisels, pulley extractors, Center punch, wire brush, drill bits, oil can, knife, inspection lamp, bolt extractor

Unit II

Measuring equipment's- steel tape measure, feeler gauge, Caliper, micrometer, engineers levels, pocket type of thermometer, sling psychomotor, system analyzers, temperature analyzers, electronic leak detector, voltmeter, clamp-on ammeter

Unit III

Specialist tools and accessories: flexible charging line, bending springs, pipe tube cutter, fin combs, soldering and brazing equipments, Vacuum pump, charging cylinders, electric test lamps, jumper lead, welding goggles

Unit IV

Pipe installation work, pumping down the system, purging the system, starting the plant

Unit V

Using a system analyzer, transferring and handling liquid refrigerant

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi
3. Electric controls for Refrigeration and Air Conditioning by B.C. Langley, D.B. Taraporevala sons and co. pvt.ltd., Bombay

Reference books

1. Hand book of Air conditioning and refrigeration by Shan K Wang, McGraw-hill international edition, Singapore
2. Refrigeration and Air Conditioning by P.L.Ballaney, Khanna publishers, New Delhi
3. Modern Refrigeration and Air Conditioning by Andrew D. Althouse,Carl h. Turnquist and Alfred F. Bracciano, The goodheart-willcox company, INC
4. Refrigeration and Air Conditioning Technology by William C. Whitman, William M. Johnson and John A. Tomczyk, Delmar Thomson learning, USA

RAC Installation Techniques - I

Unit I

Introduction: Installation operation, adding oil, testing for leak detection

Unit II

Evacuation and dehydration, removing air, charging of the system, through suction valve, through discharge valve.

Unit III

Installation of Room Air-Conditioner: Selection of proper location, providing proper slope and provision for to drain water

Unit IV

Ventilation arrangement for window air conditioner, wiring diagram for installation for room air, conditioner

Unit V

Installation of split air conditioner, providing arrangement for pipes and pipe, pipe insulations

Recommended books

1. Air conditioning: procedures and installation by V. Paul Lang, CBS publishers &distributors, Delhi

2. Refrigeration Technicians pocket book by F.H. Meredith, Butterworths

(6.VP.03) RAC System Installation & Maintenance Lab. – II

1. Leak detection in refrigeration system by different methods.
2. Air removal and charging of a refrigeration unit.
3. Testing of a refrigeration system to find out: (a) Refrigerating capacity (b) Power input c) C.O.P.
4. Determination of psychrometric properties of air with the help of a sling psychrometer and aspiration psychrometer.
5. Determination of bye pass factor of a cooling coil.
6. Determination of humidifying efficiency of a evaporative cooler.
7. Determination of cooling load for a specified situation.
8. Study of the following system by visit: (a) Ice Plant (b) Cold storage plant (c) Control air conditioning system.

SUGGESTED READING:

REFRIGERATION AND AIR CONDITIONING: A Sarao REFRIGERATION AND AIR CONDITIONING: RS Khurmi

RAC Piping Systems Lab.

List of Experiments
Any six of the following practical should be performed and recorded in laboratory book:

1. Study of piping codes, ASME codes and standards, ASTM Specifications
2. Study of Pipe-seamless, welded pipes, pipe sizes, dimensional specifications, material specifications, pipe ends
3. Study of pipe fittings–elbows, tees, flanges, butt welded end fittings, socket welded and threaded end fittings
4. valves–gate valve, globe valve, check valve, ball valve, plug valve, butterfly valve, control valve, pressure relief valve, valve codes and standard, valve size, pressure class rating.
5. Study of pipeline wall thickness calculation
6. Study of NPSH required and NPSH available for pumps
7. Study of piping load and piping stresses
8. Study of different leak detection methods
9. Checking the performance of air ducting system

Level 7 (Semester 5)

RAC Maintenance - II

Unit I

Checking the charge, electrical circuits (servicing), evacuation of the system, installation, and location of main components, leak detection methods

Unit II

Servicing Techniques: Piping and Joining Work, Burn out repair, capillary tube cleaning

Unit III

Charging the system, compressor work expansion valve (thermostatic), servicing, hermetic compressor motors (stating problems) repairing leaks, sealed system connections.

Unit IV

Electrical Fault Finding: Compressor motor fails to start, compressor motors tries to start but does not run, compressor motor starts but does not reach running speed, thermostat failure type, pressure cut-out failure, wiring and collection faults

Unit V

Mechanical Fault Finding: Fault analysis by temperature and pressure, methods of confirming the fault, finding the fault when the compressor is not running, abnormal noise problem, domestic system faults

RAC Installation Techniques – II

Unit I

Commercial Installations of Refrigeration Systems: Ice manufacturing plant, ice bank

Unit II

Commercial Installations of Refrigeration Systems: Cold storage plant, milk dairy plant

Unit III

Commercial Installation of Air Conditioning Systems: Office air conditioning, Hotel air conditioning

Unit IV

Central air conditioning, Designs, Factors of consideration for Central AC

Unit V

Automobile air conditioning: Need, Types, Selection of AC System, Ducts

Automobile Air Conditioning

Unit I

Introduction: Methods of refrigeration. Vapour compression refrigeration system, vapour absorption refrigeration system, applications of refrigeration & air conditioning, Automobile air conditioning, air conditioning for passengers, isolated vehicles, Refrigerated transport vehicles, applications related with very low temperatures, Study of Psychometric
charts: Psychometric properties, tables/charts, psychometric processes, comfort charts, factors affecting comfort, effective temperature, ventilation requirements.

Unit II

Refrigerants & AC Systems: Importance of Refrigerant- Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants; applications of refrigerants, refrigerants used in automobile air conditioning, Air Conditioning Systems- Classification, layouts, central / unitary air conditioning systems, System components, Switch and electrical wiring circuit.

Unit III

Design Automobile AC system: Load Calculations & Analysis- Design considerations for achieving desired inside/room conditions with respect to prevailing outside/environment conditions. Factors affecting/contributing towards the load on refrigeration & air conditioning systems, Cooling& heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine

Unit IV

Air Distribution: Air Distribution Systems- Distribution ducting, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations
Electronic control : Air Routing & Temperature Control - Objectives of the dashboard re-circulating unit, automatic temperature control, controlling flow, control of air handling systems & air flow through - evaporator care

UNIT V

AC Service & Control: Air Conditioning Service- Air conditioner maintenance & service - removing & replacing Components. Compressor service, Testing, Diagnosis & trouble shooting of air conditioning system, Refrigerant gas charging procedure &. Servicing of heater system, Air Conditioning Control - Common controls such as thermostats, humidistat, control dampers, pressure cut outs, relays.

Non-conventional Refrigerating System

1. Vapour Absorption Refrigeration System: Principle of absorption system, comparison between vapour compression system and vapor absorption system, theory of binary mixtures,
2. Aqua-ammonia vapour absorption system, theory of mixtures, temperature concentration diagram and enthalpy concentration diagram, processes used in aqua-ammonia absorption system, adiabatic mixing, separation, throttling process,
3. Vapour absorption system its components, working principle and mathematical analysis, b. Lithium-bromide- water absorption system its components, working principle, and mathematical analysis
4. Steam Jet Refrigeration System: Introduction, steam jet refrigeration system, components of steam jet refrigeration system, advantage and limitation of steam jet refrigeration system, performance of steam jet refrigeration system
5. Thermo-Electric Refrigeration System: Introduction, thermo-electric effects, Seebeck effect, Peltier effect, Thomson effect

Recommended books

1. A course in Refrigeration and Air Conditioning by S.C. Arora and S. Domkundwar, Dhanpatrai and sons, Delhi
2. Refrigeration and Air Conditioning by Manohar Prasad, New age international (P) limited, New Delhi

Automobile AC Lab.

1. To study the load requirement of AC in the vehicle.
2. To design the AC System for the automobile according to the use.
3. To select the components for Automobile AC System
4. To install the AC System in automobile
5. To diagnose the fault in Automobile AC System
6. To conduct the mechanical repair in the Automobile AC System
7. To charge the Refrigerant in the Automobile AC System
8. To test the Automobile AC System.

AC Components and Assembly Laboratory

Any five of the following practical should be performed and recorded in laboratory book

1. To study hermetically sealed compressor, condensing units, performance, volumetric efficiency, performance of the ideal compressor and power requirement
2. To study different types of condensers and condenser design
3. To study different types of evaporators and evaporator performance, pressure drop in tubes, frost.
4. To study selection of expansion valves, and capillaries for various refrigeration and air conditioning applications
5. Find out the heat rejection factor of condenser, condenser capacity, efficiency and effect of fouling factor
6. Capillary bore checking, performance test conducted by test rig (consisting of capillary tube and

thermostatic expansion valve) for finding C.O.P.

7. Familiarization of capillary selection guide

Level 7 (Semester 6)

RAC Safety

Unit I

Introduction to Industrial Safety: History and development of safety movement, need for safety, safety legislation: acts and rules, safety standards and codes, safety policy: safety organization and responsibilities and authorities of different levels, accident sequence theory, causes of accidents, accident prevention and control techniques, plant safety inspections, job safety analysis and investigation of accidents, first aid.

Unit II

Overview of Standard: ANSI/ASHRAE Standard, ANSI/ASME boiler and pressure vessel code, refrigeration, piping code, boiler and pressure vessel code, safety for refrigerant-containing components and accessories, nonelectrical, uniform mechanical code, basic national mechanical code

Unit III

Safety on the Job: Personal safety, protective clothing and equipment, harmful substances, safe work, practices, safety when working with electricity, refrigeration safety.

Unit IV

Safety for RAC Engineers: Types of accident, physical injuries from mechanical causes, use of tools and handling precautions, electrical injuries, electrical safety rules

Unit V

Injuries in RAC and Precaution: Refrigerant cylinder, corrosion, burn and other scalds, refrigerants and other gases Construction materials, fire fighting precautions, breathing, toxic gases, asphyxiation and precaution for the same.

Recommended books

1. “Air conditioning Systems principles, equipments and Services”, Joseph Moravek, Prentice Hall

Reference books

1. “HVAC Handbook”, Part I and II, ISHRAE
2. “Industrial refrigeration Hand Book”, Wilbert F. Stoecker

Process Planning and Cost Estimation

1. Introduction to Process Planning:

Process Planning—Definition, Purpose of Process Planning, Concept of Process Planning, Objectives of Process Planning, Scope of Process Planning, and Information required to do Process Planning, Preparing Operation Planning Sheet

2. Process Planning activities:

Process Planning Procedure, Approaches of Process Planning, Manual Process Planning, Computer Aided Process Planning, Factors Affecting Selection Process, Machine Capacity,
Determination of Man, Machine and Material Requirements, Factors Influencing Choice of Machinery

3. Introduction to Cost Estimation:
Reasons for doing Estimates, Importance of Estimating, Objectives or Purpose of Estimating, Functions of Estimating, Cost Accounting of Costing, Importance of Costing, Aims of Cost Accounting, Difference Between Cost Estimating and Cost Accounting, Cost of Product (Ladder of Cost) Production Cost Estimation, Determination of Material Cost, Mensuration in Estimating

4. Assembly & Installation Time Calculation:
Time calculation: Study of RAC requirement, design of RAC System, Selection of RAC components & material, Fabrication of ducts and distribution system, installation of RAC System, Testing of RAC System.

Project

On the basis of learning in the B.Voc. Programme, i.e. Level 5 to Level 7, a project to be taken up by the student strengthening his/ her vocational skills

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Software Development(SD)
Branch Code:106

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME

Software Development

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV511	IT Foundations & Programming Concepts	30	10	5	5	20	30		50	2
2	BSDV512	Web Designing	30	10	5	5	20	30		50	2
3	BSDV513	Programming in C	30	10	5	5	20	30		50	2
4	BSDV514	Operating System (OS)	30	10	5	5	20	30		50	2
6	BSDP511	Web Designing Lab	30				20		30	50	1
7	BSDP512	C Programming Lab	30				20		30	50	1
8	BSDP513	Language Lab	30				20		30	50	2
9	BSDT511	Technical Writer (SSC/Q0505)						Any one Training 400 hrs / 8 weeks		150	12
	BSDT512	Infrastructure Engineer (SSC/Q0801)									
	BSDT513	Associate – CRM (SSC/Q2202)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV521	Data Structures	30	10	5	5	20	30		50	2
2	BSDV522	Concepts of Data Mining	30	10	5	5	20	30		50	2
3	BSDV523	OOPs with Java	30	10	5	5	20	30		50	2
4	BSDV524	Multimedia Tools & Applications	30	10	5	5	20	30		50	2
6	BSDP521	Data Structure Lab	30				20		30	50	1
7	BSDP522	Java Lab	30				20		30	50	1
8	BSDP523	IT Tool Lab	30				20		30	50	2
9	BSDT521	Web Developer (SSC/Q0503)						Any one Training 400 hrs / 8 weeks		150	12
	BSDT522	Test Engineer (SSC/Q1301)									
Total			610							500	24

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching / Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV631	Linux Operating System – Operations and Management	30	10	5	5	20	30		50	2
2	BSDV632	Software Engineering	30	10	5	5	20	30		50	2
3	BSDV633	Web Development using PHP	30	10	5	5	20	30		50	2
4	BSDV634	Windows Development Fundamental	30	10	5	5	20	30		50	2
5	BSDE631	Uni. Human Values & ethics/Env. &Eco.	30	10	5	5	20	30		50	2
6	BSDP631	Web Development using PHP Lab	30				20		30	50	1
7	BSDP632	Window Development Fundamentals Lab	30				20		30	50	1
8	BSDT631	Junior Data Associate (SSC/Q0401)						Any one Training 400 hrs/ 6 weeks		150	12
	BSDT632	IP Executive (SSC/Q6201)									
	BSDT633	Security Analyst (SSC/Q0901)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV641	Software Testing and Project Management	30	10	5	5	20	30		50	2
2	BSDV642	Android Application Development	30	10	5	5	20	30		50	2
3	BSDV643	Window Configuration and Server Administration	30	10	5	5	20	30		50	2
4	BSDV644	Management Information Systems	30	10	5	5	20	30		50	2
5	BSDE641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BSDP641	Android Application Development Lab	30				20		30	50	1
7	BSDP642	MIS Lab	30				20		30	50	1
8	BSDT641	QA Engineer (SSC/Q1302)						Any one Training 400 hrs/ 8 weeks		150	12
	BSDT642	Software Engineer (SSC/Q4601)									
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV751	Technology Trends in IT	30	10	5	5	20	30		50	2
2	BSDV752	Window Mobile Application Development	30	10	5	5	20	30		50	2
3	BSDV753	Introduction to Python Programming	30	10	5	5	20	30		50	2
4	BSDV754	Introduction to Microprocessors	30	10	5	5	20	30		50	2
6	BSDP751	Window Mobile Application Development Lab	30				20		30	50	1
7	BSDP752	Python Programming Lab	30				20		30	50	1
9	BSDT751	Management Trainee (SSC/Q6301)						Any one Training 400 hrs/ 6 weeks		150	12
	BSDT752	Associate - Transactional F&A (SSC/Q2301)									
	BSDT753	Consultant Network Security (SSC/Q0917)									
Total			480							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BSDV761	Introduction to AI/ Computer Network Security	30	10	5	5	20	30		50	2
2	BSDV762	e-Commerce / Introduction to Biometrics	30	10	5	5	20	30		50	2
3	BSDE761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BSDP761	Major Project based on AI or Computer Network Security	180						150	150	6
5	BSDT761	Master Trainer for Software Developer (SSC/Q0509)						Any one Training 400 hrs/ 6 weeks		200	12
	BSDT762	Hardware Engineer (SSC/Q4701)									
Total			670							500	24

Detailed Curriculum

Software Requirements

1. C Compiler(Turbo C/C++ etc)
2. WYSIWYG HTML editor (Eclipse, Netbeans etc)
3. Python
4. JDK
5. Apache Tomcat
6. PHP,WAMP/XAMPP
7. DBMS(ORACLE, MySQL etc)
8. .Net Framework
9. Android Studio

Level 5 (Semester I)

IT Foundations & Programming Concepts

Computer characteristics: Speed, storage, accuracy, diligence; Digital signals, BinarySystem, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet; Hardware & Software; Von Neumann model.

Hardware: CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR

RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD/DVD-Writer; Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen Voice Input, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD, LED; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.

Software: System software, Application software; concepts of files and folders,Introduction to Operating systems, Different types of operating systems: single user, multitasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application software: Generic Features of Word processors, Spread sheets and Presentation software; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses & Protection, Free software, open source.

Computer Networks and Internet: Connecting computers, Requirements for a network:Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line Wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, Web Programming Languages.

Information Technology And Society: Indian IT Act, Intellectual Property Rights, issues.Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

Programming Concepts & Techniques: Program Concept, Characteristics of Programme,Stages in Program Development, Tips for Program Designing, Programming Aids, Algorithms, Pseudo code, Notations, Design, Flowcharts, Symbols, Rules, compiler & Interpreter. Introduction to programming techniques, Top-down & Bottom-up approach, Unstructured, & Modular programming, Cohesion, Coupling, Debugging, Syntax & Logical Errors, Linking and Loading, Testing and Debugging, Documentation**.**

Reference Books:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

Web Designing

UNIT-I

Introduction to HTTP, HTML, Basic HTML Tags, Body Tags, Coding Style, Modifying & formatting Text, Lists – Unordered, Ordered, Definition, Insert Links -Linking to another Document, Internal Links, Email Links, Relative and Absolute Links, Insert Images - Referencing Images, Clickable Images, Image Placement and Alignment, Image Size, Image Margins, Image Formats, Image Maps- Defining an Image Map, Advanced Coloring Body Content, Working with tables - Basic Tables, Table Attributes, Table Cell Attributes, Table Row Attributes, Tables Inside of Tables, Invisible Spacers, Working with Frame-Based Pages- Creating Windows, Single Window Frames, Creating Column Frames, Creating Row Frames, Creating Complex Frames.

UNIT-II

Cascading Style Sheet (CSS) – Introduction, creating style, using inline and external CSS, Creating Divs with ID style, Creating Tag& Class style, creating borders, Navigation links, creating effects with CSS.

JavaScript – Introduction, use of JavaScript in webpages. Understand JavaScript event model, use some basic event and control webpage behavior.

UNIT-III

DESIGNING WEBSITES WITH DREAMWEAVER/EXPRESSION Web/AMAYA/COFEE CUP WYSIWYG HTML Editor - Introduction to WYSIWYG HTML editor, advantages of using HTML editors, Creating a New Site, Creating a New Page, Adding Images with Alternate Text, Inserting & Formatting Text, Aligning Images, Creating an Email Link, Linking to Other Websites, Testing & Targeting Links, Organizing Files & Folders

CREATING & INSERTING IMAGES - Optimizing Images for the Web, Saving GIFs & PNGs in Photoshop, Inserting GIFs, Adjusting Transparency Settings, Saving JPGs for the Web

UNIT-IV

DESIGNING ACCESSIBLE TABLES - Understanding Tables & Accessibility, Using Tables for Tabular Data, styling a Table, Editing Table Layouts, Adding Style to a Table Using CSS CREATING WEBSITES WITH FRAMES - Introducing Frames, creating a Frameset, Opening Pages into Frames, Controlling Scrollbars & Borders, Targeting Links in Frames CUSTOMIZING THE INTERFACE - Opening an Existing Site, Reviewing Menu Options & Preferences, Comparing the Macintosh & PC Interfaces, Previewing in Browsers & Device Central

Introduction to Responsive Web Designing – Introduction, advantages, creating and using responsive web pages.

UNIT-V

Web Hosting - What is Domain? Introduction to DNS, how to register a Domain? What is web hosting? How to get a web hosting? Host your website on web Server. FTP - FTP Introduction, FTP Commands Viewing Files and Directories, FTP Commands Transfer and Rename files, FTP with WS FTP/ CuteFTP, Filezilla on Windows.

Reference Books:

1. Internet & Web Development, Soma Das Gupta, Khanna Publishing House
2. Web Designing and Development, TanweerAlam, Khanna Publishing House

Programming in C

Introduction to 'C' Language - Character set, Variables and Identifiers, Built-in Data Types,Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.

Conditional Statements and Loops - Decision making within a program, Conditions,Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming.

Arrays - One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of anelement from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Standard library string functions

Functions - Top-down approach of problem solving, Modular programming and functions,Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments.

Storage Classes - Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in a multiple source files: extern and static

Structures and Unions - Structure variables, initialization, structure assignment, nestedstructure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions

Pointers - Address operators, pointer type declaration, pointer assignment, pointerinitialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

File Processing - Concept of Files, File opening in various modes and closing of a file,reading from a file, writing onto a file

Reference Books:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Test your Skills in C, R. S. Salaria, Khanna Publishing House

Operating System (OS)

System Software: Operating System, Compiler, Interpreter and Assembler;

Operating System: Need for Operating System, Functions of Operating System(Processor Management, Memory Management, File Management and Device Management), Types of Operating System-Interactive (GUI based), Time Sharing, Real Time and Distributed, commonly used Operating System: UNIX, LINUX, Windows, Solaris, BOSS (Bharat Operating System Solutions); Mobile OS – Android, Symbian, IOS.

Utility Software: Anti-Virus, File Management tools, Compression tools and DiskManagement tools (Disk Cleanup, Disk Defragmenter, Backup).

Reference Books:

1. Operating Systems, EktaWalia, Khanna Publishing House

Web Designing Lab

1. Generic awareness about Hyper Text s Language (HTML).
2. Designing of websites.
3. Basics of HTML tags.
4. Cascading Style Sheet (CSS).
5. Functional knowledge of web hosting

C Programming Lab

1. Write a Program to find the area and circumference of circle
2. Write a Program to swap two numbers with or without third variable
3. Write a program to convert temperature from Fahrenheit to Celsius
4. write a program to add two numbers
5. Write a C program to input any alphabet and check whether it is vowel or consonant.
6. Write a C program to input any character and check whether it is alphabet, digit or special character.
7. Calculator program with Basic operations using switch
8. Program to find factorial of a given number
9. Program to find sum of Fibonacci series up to N Terms.
10. program to check whether the number is palindrome or not
11. Program to find the second largest number in an array.
12. 2. Write a 'C' function to print reverse of a given number using return and parameter method.(call by value)
13. 3. Write a 'C' function to calculate the sum of digits of a given number using return and parameter method.(call by value)
14. 4. Program to insert element in an array.
15. 5. Find the repeating elements in a given array
16. C program to delete duplicate element in an array.
17. C program to find multiplication of two matrices.
18. 8. Program to store and access “id, name and percentage” for 3 students. Structure array is used in this program to store and display records for many students. You can store “n” number of students record by declaring structure variable as ‘struct student record[n]“, where n can be 1000 or 5000 etc.
19. 9. Program to copy one file into another.
20. 0. Program to count number of alphabet, number, spaces, newline characters from a file.

Level 5 (Semester II)

Data Structure

UNIT I

An Overview of Computers and Programming - Simple program logic, The steps involved in the program development cycle, Pseudo code statements and flowchart symbols, Using a sentinel value to end a program, Programming and user environments, The evolution of programming models.

UNIT–II

The concept of data structure, Abstract data structure, Analysis of Algorithm, The concept of List Introduction to stack & primitive operation on stack, Stack as an abstract data type, Multiple Stack, Stacks application: Infix, post fix, Prefix and Recursion, Introduction to queues, Primitive Operations on the Queues, Queue as an abstract data type, Circular queue, Dequeue, Priority queue, Applications of queue

UNIT–III

Introduction to the Linked List of Stacks, Basic operations on linked list, Stacks and queues as a circular linked list, Header nodes, Doubly Linked List, Circular Linked List, Stacks & Queues as a Circular Linked List, Application of Linked List.

UNIT–IV

TREES - Basic Terminology, Binary Trees, Tree Representations as Array & Linked List, Basic operation on Binary tree, Traversal of binary trees: - In order, Preorder & post order, Application of Binary tree, threaded binary tree, B-tree & Height balanced tree, B+ & B* trees, 2-3 trees, Binary tree representation of trees, Counting binary trees

UNIT–V

Sequential Searching, Binary search, Insertion sort, Selection sort, Quick sort, Bubble sort, Heap sort, Comparison of sorting methods

Hash Table, Collision resolution Techniques, Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs, Graph Traversal-Depth first & Breadth first search, Spanning Trees, minimum spanning Tree, Shortest path algorithm

Reference Books:

1. Data Structures, R.S. Salaria, Khanna Publishing House

Concepts of Data Mining

Unit-I

Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:-Dependent Data Marts, Independents Data Marts & Distributed Data Marts, Conceptual Modeling of Data Warehouses: -Star Schema, Snow flake Schema, Fact Constellations, Multidimensional Data Model & Aggregates.

Unit-II

OLAP, Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP & OLTP, OLAP Servers: -ROLAP, MOLAP, HOLAPQueries.

UNIT-III

Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing:-Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics. Guidelines for Successful Data Mining.

Unit-IV

Association Rule Mining:-Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori - Tid, Direct Hasing and Pruning (DHP), Dynamic Item set Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms,

Unit-V

Classification:-Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Basedon Information Theory, Split Algorithm Based on the Gini Index, Over fitting and Pruning, Decision Trees Rules, Naïve Bayes Method.

Cluster Analysis: -Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: -Partitioned Methods, Hierarchical Methods, Density-Based Methods, Dealing with Large Databases. Quality and Validity of Cluster Analysis Methods.

Reference Books:

1. Data Mining and Warehousing, Ikvinderpal Singh, Khanna Publishing House

Object Oriented Programming with JAVA

UNIT–I

C++ vs JAVA, JAVA and Internet and WWW, JAVA support systems, JAVA environment.

JAVA program structure, Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, Declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting.

Operators: Arithmetic, Relational, Logical Assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions & its evaluation.

If statement, if…else… statement, Nesting of if…else… statements, else…if Ladder, Switch, ?operators, Loops – While, Do, For, Jumps in Loops, Labelled Loops.

UNIT–II

Defining a Class, Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods.

Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control.

UNIT–III

Arrays: One Dimensional & two Dimensional, strings, Vectors, wrapper Classes, Defining Interface Extending Interface, Implementing Interface, Accessing Interface Variable, System Packages, Using System Package, Adding a Class to a Packages, Hiding Classes.

UNIT–IV

Creating Threads, Extending the Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface.

UNIT–V

Local and Remote Applets Vs Applications, Writing Applets, Applets Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing Parameters to Applets, Aligning the Display, HTML Tags & Applets, Getting Input from the User.

Reference Books:

1. Object Oriented Systems with Java, TanweerAlam, Khanna Publishing House
2. Core Java, TanweerAlam, Khanna Publishing House

MULTIMEDIA – TOOLS & APPLICATIONS

UNIT -I

Introduction To Multimedia, Needs and Areas of use, Identifying Multimedia Elements - Text, Images, Sound, Animation and Video, Making Simple Multimedia With PowerPoint. TEXT - Concepts of Plain & Formatted Text, RTF & HTML Texts, Using Common Text Preparation Tools, Conversion to and from of Various Text Formats, Creating text using standard software.

UNIT-II

SOUND - Sound and its Attributes, Sound and Its Effects in Multimedia, Frequency, Sound Depth, Channels and its Effects on Quality and Storage, Size Estimation of Space of a Sound File, Sound Card Standard – FM Synthesis Cards, Waves Table Cards, MIDI and MP3 Files and Devices, 3D Sounds, Recording and editing sound using sound editors like Audacity, Sound forge etc.

UNIT-III

IMAGES - Importance of Images Graphics in Multimedia, Vector and Raster Graphics, Regular Graphics vs. Interlaced Graphics, Image Capturing Methods - Scanner, Digital Camera Etc. Color models-RGB, CYMK, Hue, Saturation, and Brightness, Various Attributes of Images Size, Color, Depth Etc, Various Image File Format BMP, DIB, CIF, PIC, and TIF Format Their Features And Limitations, Image format conversion, various effects on images. Create images using Photoshop, CorelDraw and apply various effects, Using Layers, Channels and Masks in images.

UNIT-IV

VIDEO- Basic of Video, Analog and Digital Video Type of Video, Digitization of Analog Video, Video Standard – NTSC, Pal, HDTV, Video Capturing Media /Instruments Videodisk Camcorder Compression Techniques, File Formats AVI, MJPG, MPEG, Video Editing and Movie Making Tools, converting formats of videos, recording and editing videos using video editing software like adobe premiere or Sony Vegas.

UNIT-V

ANIMATION- Concepts of animation, 2D and 3D animation, tools for creating animation, character and text animation, creating simple animation using GIF animator and flash, Morphing and Applications.

Authoring tools for Multimedia – Introduction to various types of multimedia authoring tools, CD/DVD based and web based tools, features and limitations, creating multimedia package using all components.

Reference Books:

1. Multimedia & Its Applications, V.K. Jain, Khanna Publishing House
2. Fundamentals of Multimedia, Ramesh Bangia, Khanna Publishing House

Data Structure Lab

.Implement stack. Write functions like push, pop, Initialize, Empty or Full. 2
.WAP to Convert the Infix expression into postfix using STACK.
.WAP to Convert the Infix expression into Prefix using STACK. 4
.Implement concept of queues
5. Implement circular Queue using Array.
6. WAP to implement STACK using
Link List 7WAP to implement Queue using
Link List
.Implement queues as a circular linked list. 9
.Implementing doubly linked list
10. Binary search tree to sort an array

Java Lab

1. Write a Program to accept a String as a Command line argument and the program should print a
Welcome message.
2. Create a class Box that uses a parameterized method to initialize the dimensions of a box.(dimensions are width, height, depth of double type). The class should have a method that can return volume. Obtain an object and print the corresponding volume in main() function.
3 Write a Program that will check whether a given String is Palindrome or not
4. Write a Java Program for Multiplication of two matrices.
5. Write a program to check if given String is Palindrome or not.
6. Given two strings, append them together (known as "concatenation") and return the result. However, if the concatenation creates a double-char, then omit one of the chars. If the inputs are "Mark" and "Kate" then the ouput should be "markate".
7. Create an abstract class Instrument which is having the abstract function play.
Create three more sub classes from Instrument which is Piano, Flute, Guitar. Override the play method inside all three classes printing a message
"Piano is playing tantantantan " for Piano class
"Flute is playing toottoottoottoot" for Flute class
"Guitar is playing tintintin " for Guitar class
8. Write a program that takes as input the size of the array and the elements in the array. The program then asks the user to enter a particular index and prints the element at that index.
This program may generate Array Index Out Of Bounds Exception. Use exception handling mechanisms to handle this exception. In the catch block, print the class name of the exception thrown.
9. Create two threads and assign names 'Scooby' and 'Shaggy' to the two threads. Display both thread names.
10 0. Write an Applet program in Java to display "Welcome to Java".

Level 6 (Semester III)

Linux Operating System - Operations & Management

UNIT – I

Linux introduction and file system - Basic Features, Advantages, Installing requirement, Basic Architecture of Unix/Linux system, Kernel, Shell.

Linux File system-Boot block, super block, Inode table, data blocks, How Linux access files, storage files, Linux standard directories, Commands for files and directories cd, ls, cp, md, rm, mkdir, rmdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces, Partitioning the Hard drive for Linux, Installing the Linux system, System startup and shut-down.

UNIT–II

Essential Linux commands Understanding shells, Processes in Linux process fundamentals, connecting processes with pipes, redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep, Printing commands, grape, fgrep, find, sort, Cal, banner, touch, file,file related commands-ws, sat, cut, grep, dd, etc.Mathematical commands- bc, expr, factor, units.vi, joe, vim editor

UNIT–III

Shell programming Basic of shell programming, Various types of shell, shell programming in bash, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, shell keywords, Creating Shell programs for automate system tasks and report printing, use of grep in shell, awk programming.

UNIT–IV

System administration Common administrative tasks, identifying administrative files – configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su.Getting system information - host name, disk partitions & sizes, users, kernel.

Backup and restore files, linuxconf. utility in GUI, reconfiguration hardware with kudzu Configure desktop-X configurator, understanding XF86config file, starting & using X desktop. KDE & Gnome graphical interfaces, changing X settings.

UNIT–V

Basic networking administration Setting up a LAN using Linux, choosing peer to peer vs client/server model, setting up an Ethernet Lan, configuring host computers, checking Ethernet connecting, connecting to internet, administration in a networked environment, common networking administrative tasks, the network file system, configuring Ethernet, initializing Ethernet Interface, ifconfig, netstat and netconfig commands a TCP/IP networks, DNS services, routing using Linux, SLIP & PPP services, UUCP.Installation & Administration of mail server, ftp server and Apache web server.

Software Engineering

UNIT - I

SOFTWARE **:** Software Characteristics, Components & Applications, Software Engineering - A Layered Technology, Software Process Models - Linear Sequential Model, Prototype & Rad Model., Evolutionary Software Process Model – Incremental Model and Spiral Model.

SOFTWARE PROJECT MANAGEMENT: Project Management Concepts – People Problem and Process S/W process and Project Metrics : Metrics in The Process and Project Domains . Software Measurement –Size Oriented, Function Oriented Metrics, Extended Function

UNIT - II

SOFTWARE PROJECT PLANNING: Objectives, Scope, Project Estimation, Decomposition Techniques, Empirical Estimation Models.

ANALYSIS CONCEPT AND PRINCIPLES: Requirement Analysis, Communication Techniques, Analysis Principles, Software Prototyping, Specifications.

ANALYSIS MODELING: Elements of The Analysis Modeling, Data Modeling. Functional Modeling and Information Flow, Behavioral Modeling, Data Dictionary.

UNIT – III

DESIGN CONCEPTS AND PRINCIPLES: Design Process, Design Concepts, Design Principles, Effective Modular Design. DESIGN METHODS : Architectural Design Process, Transform Mapping and Transaction Mapping, Interface Design, - Internal and External Design, Human Computer Interface Design, Interface Design Guidelines, Procedural Design.

UNIT - IV

S/W Quality Assurance : Quality Concepts, Matrix for Software Quality, Quality Movement, S/W Q A, S/W Review, Formal Technical Reviews, Formal Approaches to SQA, S/W Reliability, ISO 9000 quality Standards S/W TESTING MODELS : S/W Testing Fundamentals, Test Case Design, White and Black Box Testing, Basic Path Testing, Control Structure

S/W TESTING STRATEGIES : Strategic Approach To S/W Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging

UNIT - V

S/W REUSE : Reuse Process, Building Reuse Components, Classified And Retrieving Components, Economics Of S/W Reuse COMPUTER AIDED S/W ENGINEERING: Introducing of Case, Building Block For Case, Taxonomy Of Case Tools, Integrating Case Environment, Integrating Architecture, Case Repository.

Reference Books:

1. Software Engineering, N.S. Gill, Khanna Publishing House
2. Software Engineering, R.P. Mahapatra, Khanna Publishing House

Web Development using PHP

UNIT I

Introduction to PHP as a programming Language: - Advantages of PHP, the server side architecture Decomposed, overview of PHP, history, object oriented support, benefits in running PHP as a server side script. Installing a web server, Internet information server, and IIS installation, testing web server setup.

UNIT II

The basics of PHP: - data types, variables, constants, operators, Arrays, Conditional statements (if statement, Executing Multiple Statements, else if clause and switch
statement), Iterations (for loop, while loop, controlling an array using a while loop, do while statement, for each loop and special loop key words)

UNIT III

Functions, user defined functions, functions with arguments, built in functions (print(), includer(), header(), phpinfo()), PHP server Variables, working with date and time , performing mathematical operations , working with string functions . System Variable (GET, POST, cookies& Session, Forums)

UNIT IV

Working with forms, form elements (Text Box, Text Area, Password, Radio Button, Checkbox, The Combo Box, Hidden Field and image), adding elements to a form, uploading files to the Web Server using PHP, building a challenge and response subsystem and understanding the functionality of the FORM attribute Method Regular Expressions: - Engine, types of Regular Expressions, symbols used in Regular Expressions. Error handling in PHP: - Displaying errors, warnings, types of errors, error levels in PHP, logging Errors and Ignoring errors.

UNIT V

Data base connectivity using PHP (MySQL, ODBC, ORACLE, SQL) Performing, executing Commands, different types of Data Base Operations like Insertion, deletion, update and query on data

Reference Books:

1. Mastering PHP, WebTech Solutions, Khanna Publishing House
2. Learning PHP, Ramesh Bangia, Khanna Publishing House

Window Development Fundamentals

1. Programming web applications
2. Working with data and services
3. Troubleshooting and debugging web applications
4. Working with client-side scripting
5. Configuring and deploying web applications
6. Understanding core programming
7. Understanding object-oriented programming
8. Understanding general software development
9. Understanding web applications
10. Understanding desktop applications
11. Understanding databases

Reference Books:

1. Internet and Web Development, Soma Das Gupta, Khanna Publishing House

Web Development using PHP Lab

1 . Write a program to display “Hello World”.
2 . Write a program to print an array of Strings.
3 Write a program to print each element of an array using foreach().
4. Write a program to find number of elements in an array.
5. Write a program to sort elements in an array in ascending order.
6. Write a program to find the sum of elements in an array.
7 . Write a program to find the product of elements in an array.
8 . Write a program to split a string as array elements based on delimiter.
9 Write a program to combine the array elements into a string with given delimiter.
10. Write a program to join the array elements into a string.
11. Write a program to merge two arrays into a new array.
12. Write a program to remove the duplicated values from an array.
13. Write a programs to create simple Login and Logout using sessions.
14. Write a program to Upload a file to the Server.
15. Write a program to connect to the server and selecting database.
16. Write a program to Insert records to the table in Database.
17. Write a program to fetch records from the table in Database.
18. Write a program to Store and Read an image in Database.
19. Write a program to create a simple Registration form.
20. A simple CRUD operations using PHP and Mysql.

Window Development Fundamentals Lab

1. Client-side scripting Programs
2. Deploying web applications
3. Basic object-oriented programs
4. Understanding desktop applications
5. Basic SQL Queries

Level 6 (Semester IV)

Software Testing & Project Management

UNIT - I

Testing basics and Development Models: Principals and context of testing in software production, Usability and Accessibility Testing, Phases of Software Project, Process models to represents different phases, Software Quality Control and its relation with testing, validating and verification, Software Development life cycle models, various development models.

White Box Testing: White Box Testing - Static Testing, Structural Testing-Unit code functional testing, Code coverage testing, code complexity testing,

Black Box Testing- What? Why and when to do Black box testing, Requirements based testing, Positive and Negative Testing, Boundary value testing, Decision Tables, Equivalence Partitioning, State Based or Graph Based Testing, Compatibility Testing, User Documentation Testing, Domain Testing.

UNIT - II

Integration Testing: Introduction and types of integration testing, Scenario testing, defect bash. System and Acceptance Testing- Overview, functional and non-functional testing, Acceptance testing.

Overview of some software testing tools: WinRunner, LoadRunner, Test Director.

(Some practical should be conducted using these tools)

UNIT- III

Performance Testing- Introduction, factors related to performance testing, methodology for performing testing, Regression Testing,

Ad hoc Testing- Overview, Buddy & pair testing, Exploratory testing, Interactive testing, Agile and extreme testing.Testing of Object Oriented Testing – Introduction, Differences in OO testing.

UNIT – IV

Software Project Management: Overview, Software Project Management Framework, Software Development life cycle,

Organization Issues and Project Management, Managing Processes, Project Execution, Problems in Software Projects, Project Management Myths and its clarifications.

Software Project Scope: Need to scope a software project, scope management process, communication techniques and tools, communication methodology

Software Requirement Gathering and Resource allocation: Requirement specifications, SRS Document preparation, Resources types for a software projects, requirement for resources allocation.

UNIT – V

Software Project Estimation: Work Breakdown structure (WBS), steps in WBS, Measuring efforts for a project, techniques for estimation – SLOC, FP, COCOMO and Delphi methods.

Project Scheduling: Scheduling and its need, scheduling basics, Gannt Chart, Network scheduling techniques, Pert and CPM.Using a Project Management Tool: Introduction to MS Project 2000, Managing tasks in MS Project 2000, Tracing a project plan, creating and displaying project information reports.

Android Application Development

UNIT-I

Android Introduction, Smartphones future, Preparing the Environment, Installing the SDK, Creating Android Emulator, Installing and Using Eclipse, Installing Android Development Tools, Choosing which Android version to use Android Architecture, Android Stack, Android applications structure Creating a project, Working with the AndroidManifest.xml, Using the log system Activities Introduction to UI – Layouts, Fragments, Adapters, Action bar, Dialogs, Notifications , UI best practices

UI Architecture, Application context, Intents, Activity life cycle, Supporting multiple screen sizes

Unit – II

Designing User Interface Using Views – Basic Views- TextView, Button, Image Button, Check Box, Toggle Button, Radio Button etc., Progress Bar View and Auto Complete Text View, Time Picker and Date Picker View, List View,

Image View, Image Switcher and Grid View, Digital Clock & Analog Clock Views Notification and Toast, Parameters , on Intents, Pending intents, Status bar notifications Toast notifications.

UNIT-III

Menus, Localization, Options menu, Context menu Dialogs-Alert dialog, Custom dialog, Dialog as Activity Orientation and Movement- Pitch, roll and yaw, Natural device orientation, Reference frame remapping SMS - Sending and Receiving Working with Media –Playing audio and video, Recording audio and video.

UNIT-IV

Location and Maps - Google maps, Using GPS to find current location.

Working with data storage - Shared preferences, Preferences activity, Files access, Using External storage, SQLite database Animation-View animation, Drawable animation Working with Sensors - Finding sensors, Accelerometers, Gyroscopes, Other types Working with Camera – Controlling the camera, Preview and overlays, Taking pictures

UNIT-V

Content providers- Content provider introduction, Query providers

Network Communication - Web Services, HTTP Client, XML and JSON, Using e-mails.

Services - Service lifecycle, Foreground service, Creating own services

Publishing and Distributing Your App -Preparing for publishing, Google Play requirements, Signing and preparing the graphics, Publishing to the Android Market, Monetization, Tips on becoming a top app, Google analytics

Reference Books:

Learning Android, Ramesh Bangia, Khanna Publishing House

Windows Configuration and Server Administration

Understanding Windows Programming Basics: Identify Windows application types, Implementuser interface design.

Creating Windows Forms Applications: Create and handle events, Understand Windows Formsinheritance, understand how to create new controls and extend existing controls, Validate and
implement user input, Debug a Windows-based application.
Creating Windows Services Applications: Create a Windows Services application, InstallaWindows Services application.

Accessing Data in a Windows Forms Application: Understand data access methods for aWindows Application, Understand data bound controls.
Deploying a Windows Application: Understand windows application deployment methods,integrating data.
Network basics: Type of Networks, Topologies, Transmission media, Install UTP(Straight, Cross,Rollover Cables), IP Addressing, Subneting, OSI Model, TCP/IP Model, Wireless Network, Network Devices.

Installation: Installation Server, Drivers, Working with windows server Devices, TroubleshootingDevices & Drivers, Managing system updates.
Working With Disk Storage: Type of Disk Storage, Type of volumes, Implementing fault tolerance,Use disk management tools, Disk Quota, Troubleshooting disk management, Shadow copy**.Domain Controller**: Install Active Directory, Manage Active Directory Component, Working withOU Structure, Working with Domain User account, Working with Domain Groups, Troubleshooting Active Directory.

Domain Name Services (DNS): Define Name resolution, Install DNS, Configure DNS Client, Manageand Troubleshoot DNS.

Dynamic Host Configuration Protocol: Configure DNS Server, Working With Super Scope,Configure DHCP Client, Manage and Troubleshoot DHCP Server.

Backup and Restore: Requirement for Backup and Recovery AD, Issue for AD Backup andRecovery, Steps for Backup and Recovery AD.

Management Information System

Unit I

An introduction to information systems, Information systems in organizations, Information Technology Concepts, The IS Revolution; Information requirement for the different levels lf management, transaction processing system, Management information 34 system, Decision support system. Strategic Role of Information Systems.Business Processes; Information management, and Decision Making. Computers and Information Processing;

Unit II

Transaction processing system; hardware and software requirements, tools used, case studies, merits and demerits of transaction processing system.

Unit III

Managerial control, Information and tools required, difference between transactional system and managerial system. Frequency of taking outputs, Need for interconnected system, common database, Redundancy control, case studies. Decision support system, concept and tools, case studies, virtual organizations, strategic decisions-unstructured approach, cost and values of unstructured information.

Unit IV

Optimization techniques, difference between optimization tools and DSS tools expert system, difference between expert system and management information system. Role of chief Information officer.

Android Application Development Lab

1. Write a simple Application which will print "Hello World!”
2. Write a simple Application that uses UI Layout and Control.
3. Write a simple Application that makes use of Style & Themes.
4. Write a simple Application that uses Event Handling.
5. Write a simple Application that uses Alarm, Notification.
6. Make a location based app.
7. Write a program that shows the use animation.
8. Write a program that shows the use of Image Effects.
9. Write a program that shows the use Image Switcher.
10. Write a program that shows the use of database.

MIS Lab

Experiments to be covered based on the theory covered in class

Level 7 (Semester V)

Technology Trends in IT

Unit-I

Internet of Things (IoT) –Definition of IoT, History of IoT, IoT vs. similar concepts,Application/Segment overview, Technology overview

Unit-II

Big Data Analytics: Concepts, examples of big data analytics, benefits of big data analytics,Technologies, and Applications, requirements for being successful with big data analytics

Unit-III

Cloud Computing – Introduction, Why cloud services are popular, advantages, Characteristics,Service models, Deployment of cloud services, Potential privacy risks

Unit-IV

Cyber Security – Introduction, risks, Malicious code, Hacker, attacker or intruder, Cyber securityPrinciples, Information Security (IS) within Lifecycle Management, Risks & Vulnerabilities, Incident Response, Future Implications & Evolving Technologies

Unit-V

Wearable Technologies – Introduction, Applications of Wearable Technology, Challenges toWearable Technology, various Wearable devices.

Reference Books:

1. Computer Today, A. Ravichandran, Khanna Publishing House
2. Internet of Things, Jeeva Jose, Khanna Publishing House
3. Big Data and Hadoop, V.K. Jain, Khanna Publishing House
4. Data Sciences and Analytics, V.K. Jain, Khanna Publishing House

Windows Mobile Application Development

Unit-I

INTRODUCTION TO WINDOWS 8 APPLICATION DEVELOPMENT - brief history of windows application development, History of APIs and Tools, Operating System Input Methods

The Windows Charm Bar, Start Button, Search Button, Share Button, Devices Button, Settings Button, Windows Desktop, Switching between Desktop Programs

WINDOWS 8 ARCHITECTURE FROM A DEVELOPER'S POINT OF VIEW - Windows 8 Development Architecture, Desktop Application Layers, Understanding Windows Runtime: Windows Runtime Architecture Overview, Metadata in Windows Runtime, .NET Framework 4.5: The Installation Model of .NET Framework 4.5, Window Runtime Integration, Picking the Appropriate Technology for Your Project, Choosing a Programming Language

GETTING TO KNOW DEVELOPMENT ENVIRONMENT - Introducing the Toolset, Visual Studio IDE:

Creating a New Project, Lighting Up Your Applications with Expression Blend

UNIT-II

PRINCIPLES OF MODERN WINDOWS APPLICATION DEVELOPMENT - Windows 8 Style Application, Windows 8 Design Language, Introduction to Asynchronous Programming, Evolution of Asynchronous, Programming on the .NET Platform

CREATING WINDOWS 8 STYLE APPLICATIONS WITH HTML5, CSS, AND JAVASCRIPT - HTML5 and CSS on the Web, HTML5 Technologies, HTML5 Applications on Windows Runtime, The Windows Library for JavaScript (WinJS), Creating Windows 8 Style Applications with JavaScript, Accessing the Filesystem, Managing Data, Respecting the User's Device

UNIT-III

USING XAML TO CREATE WINDOWS 8 STYLE USER INTERFACES - Describing the User Interface Using XAML, Using Namespaces, Understanding the Layout Management System, Reusable Resources in XAML, Basic Controls in Windows 8 Style Applications: Controls with Simply Accessing the Internet: e Values, Content Controls, Working with Data: Data Binding Dependency Properties and Notifications, Binding Modes and Directions

WORKING WITH XAML CONTROLS - Using Animations in Application, Designing the Visual Look of a Control, Working with Complex Controls: Getting to Know the List View Base Controls, Using the Grid View Control, Binding to Data, Grouping Data, Defining Visual Groups

BUILDING WINDOWS 8 STYLE APPLICATIONS - The Lifecycle of a Windows 8 Application, Deploying Windows 8 Apps, Commanding Surfaces, Persisting Application Data, Applications and the Start Screen

UNIT-IV

CREATING MULTI-PAGE APPLICATIONS - Navigation Basics, working with Pages, Using the Split Application and Grid Application Templates

BUILDING CONNECTED APPLICATIONS - Integrating with the Operating System and Other Apps: Picker Unified Design to Access Data, Understanding the Concept of Contracts, Accessing the Internet: Detecting the Changes of Internet Connectivity, Using Feeds, Accessing Windows Live LEVERAGING TABLET FEATURES - Accommodating Tablet Devices, Building Location-Aware Applications, Using Sensors: Using Raw Sensor Data, Using Sensor Fusion Data

UNIT-V

ADVANCED PROGRAMMING CONCEPTS - Building Solutions with Multiple Languages: Hybrid Solutions, Background Tasks: Understanding Background Tasks, How Background Tasks Work,

Cancelling Background Tasks, Implementing Background Tasks, creating a Simple Background Task, Managing Task Progress and Cancelation, Input Devices

TESTING AND DEBUGGING WINDOWS 8 APPLICATIONS - The Quality of Software, Becoming Familiar with Debugging, Controlling the Program Flow in Debug Mode, Monitoring and Editing Variables, Changing the Code While Debugging, Windows 8 Style Application-Specific Scenarios, Introduction to Software Testing, Introduction to Unit Testing, Unit Testing Windows 8 Style Applications

INTRODUCING THE WINDOWS STORE - Getting to Know the Windows Store, How Customers See an App in the Windows Store, Application Details, Making Money with Your App, The Developer Registration Process: Submitting the Application, The Application Certification Process, The Windows App Certification Kit.

Introduction to Python Programming

- Familiarization with the basics of Python programming: a simple “hello world" program, process of writing a program, running it, and print statements; simple data-types: integer, float, string

- Introduce the notion of a variable, and methods to manipulate it (concept of L-value and R-value even if not taught explicitly)

- Knowledge of data types and operators: accepting input from the console, assignment statement, expressions, operators and their precedence.

- Conditional statements: if, if-else, if-elif-else; simple programs: e.g.: absolute value, sort numbers, and divisibility.

- Notion of iterative computation and control flow: for, while, flowcharts, decision trees

- and pseudo code; write a lot of programs: interest calculation, primarily testing, and factorials.

- Idea of debugging: errors and exceptions; debugging: pdb, break points.

- Lists, tuples and dictionary: finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary. Introduce the notion of accessing elements in a collection using numbers and names.

- Sorting algorithm: bubble and insertion sort; count the number of operations while sorting.

- Strings: compare, concat, substring; notion of states and transitions using state transition diagrams.

Reference Books:

1. Introduction to Computing and Problem Solving With Python, Jeeva Jose, Khanna Publishing House
2. Taming Python by Programming, Jeeva Jose, Khanna Publishing House

Introduction to Microprocessors

Digital Design and VHDL

Introduction
Combinational Logic
Structural Modeling
Sequential Logic
Finite State Machines
Parameterized Modules
Testbenches

Arithmetic Logic Unit (ALU)

1. Introduction
2. Arithmetic Circuits
3. ALU
4. Number Systems

Microprocessor I: Instruction Data Set. Machine Language

1. Introduction
2. Assembly Language
3. Machine Language
4. Programming
5. Addressing Modes
6. Lights, Camera, Action: Compiling, Assembling, and Loading
7. Odds and Ends

Microprocessor II: Control and Datapath Design. Single-Cycle Processor

1. Introduction
2. Performance Analysis
3. Single-Cycle Processor

Microprocessor III: Control and Datapath Design. Multi-cycle Processor

1. Introduction
2. Performance Analysis
3. Multicycle Processor
4. Pipelined Processor

Memory systems and I/O.

Introduction
Memory System
Caches
Virtual Memory
Memory-Mapped I/O
Memory map
I/O Devices
Buses and organization

Reference Books:

1. Fundamentals of Microprocessor, M.K. Ghodki, Khanna Publishing House
2. Advance Microprocessor, A.K. Gautam, Khanna Publishing House

Windows Mobile Application Development Lab

1. Working with J2ME Features
2. Threads & High level UI
3. Developing networked applications using the wireless toolkit
4. Authentication with a webserver
5. Study Windows API's. Find out their relationship with MFC classes. Appreciate how they are helpful in finding complexities of windows programming.

Python Programming Lab

1. Python Program to Print Hello world!
2. Python Program to Add Two Numbers
3. Python Program to Check if a Number is Odd or Even
4. Python Program to Solve Quadratic Equation
5. Python Program to Check Armstrong Number
6. Python Program to Find the Sum of Natural Numbers
7. Write a Python program to get unique values from a list
8. Python Program to Illustrate Different Tuple Operations
9. Python Program to Check Whether a String is Palindrome or Not
10. Write a Python program to remove duplicates from Dictionary
11. 1. Write a Python program to sort a list alphabetically in a dictionary
12. 2. Python Program to Illustrate Different Set Operations (Union, Intersection, Difference and Symmetric Difference)
13. Python Program to illustrate the concept of Binary Relations in Set.
14. Python Program to Generate a Random Number
15. 5. Python Program to Convert Decimal to Binary, Octal and Hexadecimal
16. 6. Python Program to Find HCF or GCD
17. Given two integers x and n, compute x^n.
18. Python Program to Find Factors of Number
19. Python Program to Make a Simple Calculator
20. Python Program to Find Factorial of Number Using Recursion

Level 7 (Semester VI)

Introduction to AI

UNIT – I

Overview of A.I: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success. Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem Heuristic search techniques : Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

UNIT - II

Knowledge Representation: Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation. Using Predicate Logic: Represent ting Simple Facts in logic, Representing instances and is-a relationship, Computable function and predicate.

UNIT - III

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing. Learning: Introduction learning, Rote learning, Learning by taking advice, Learning in problem solving, Learning from example-induction, Explanation based learning.

UNIT - IV

Expert System: Introduction, Representing using domain specific knowledge, Expert system shells. Knowledge acquisition: General concepts in knowledge acquisition, early work in Machine Learning, examples of Inductive Learners, computer vision, Robotics, overview of LISP- AI language.

Reference Books:

1. Artificial Intelligence, Munish Chandra Trivedi, Khanna Publishing House

OR

Computer Network Security

UNIT-I

Network Concept, Benefits of Network, Network classification (PAN, LAN, MAN, WAN), Peer to Peer, Client Server architecture, Transmission media: Guided & Unguided, Network Topologies. Networking terms: DNS, URL, client server architecture, TCP/IP, FTP, HTTP, HTTPS, SMTP, Telnet OSI and TCP/IP Models: Layers and their basic functions and Protocols, Comparison of OSI and TCP/IP. Networking Devices: Hubs, Switches, Routers, Bridges, Repeaters, Gateways and Modems, ADSL.

UNIT-II

Ethernet Networking: Half and Full-Duplex Ethernet, Ethernet at the Data Link Layer, Ethernet at the Physical Layer. Switching Technologies: layer-2 switching, address learning in layer-2 switches,

network loop problems in layer-2 switched networks, Spanning-Tree Protocol, LAN switch types and working with layer-2 switches, Wireless LAN

UNIT- III

Internet layer Protocol: Internet Protocol, ICMP, ARP, RARP. IP Addressing: Different classes of IP addresses, Sub-netting for an internet work, Classless Addressing. Comparative study of IPv4 & IPv6.Introduction to Router Configuration.Introduction to Virtual LAN.

UNIT- IV

Transport Layer: Functions of transport layer, Difference between working of TCP and UDP.
Application Layer: Domain Name System (DNS), Remote logging, Telnet, FTP, HTTP, HTTPS.
Introduction to Network Security.

Reference Books:

1. Information & Computer Security, Sarika Gupta, Khanna Publishing House
2. An Integrated Approach to Computer Networks, BhavneetSidhu, Khanna Publishing House

e-Commerce

Unit I

Introduction E-Business: Origin and Need of E-Commerce, Factors affecting E -Commerce, Business dimension and technological dimension of E-Commerce, E-Commerce frame work Electronic Commerce Models, Value Chains in Electronic Commerce.

Unit II

Internet and E-Business: Introduction to Internet and its application, Intranet and Extranets. World Wide Web, Internet Architectures, Internet Applications, Business Applications on Internet, E - Shopping, Electronic Data Interchange, Components of Electronic Data Interchange, Creating Web Pages using HTML.

Unit III

Technology for Online Business: Internet, IT Infrastructure, Middleware Contents, Text and Integrating E-Business Applications, Mechanism of Making Payment Through Internet, Online Payment Mechanism, Electronic Payment Systems, Payment Gateways, Visitors to
Software Development Website, Tools for Promoting Website, Plastic Money, Debit Card, Credit Card, Laws Relating to Online Transactions.

Unit IV

Applications in E-commerce: E-commerce Applications in Manufacturing, Wholesale, Retail and Service Sector.

Reference Books:

1. E-Commerce, Sarika Gupta, Khanna Publishing House

OR

Introduction to Biometrics

Unit I

Concepts - biometric recognition, biometrics, requirements for biometrics
Biometric systems, their modes and architectures, Biometric system errors and evaluation, Software Development

Unit II

Overview, comparison and evaluation of various biometrics
Unimodal biometric systems, their advantages, disadvantages and limits
Multimodal biometric systems, their modes of operation, levels of fusion

Unit III

Biometric pattern recognition methods
Privacy protection and social acceptance
Biometric standardization, data formats
Design and implementation of biometric systems, applications of biometric systems, biometric databases, security of biometric systems

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Graphics & Multimedia(GM)
Branch code:107

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME

Graphics & Multimedia

Level 5 SEMESTER- I											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BGMV511	Web Applications	30	10	5	5	20	30		**50**	**2**
2	BGMV512	Communication Skill-I	30	10	5	5	20	30		**50**	**2**
3	BGMV513	Graphic Design (Basic Sketching and Human Anatomy in Drawing)	30	10	5	5	20	30		**50**	**2**
4	BGMV514	Illustration And Photo-Editing	30	10	5	5	20	30		**50**	**2**
6	BGMP511	Web Applications –Lab	30				20		30	**50**	**1**
7	BGMP512	Illustration And Photo-Editing –Lab	30				20		30	**50**	**1**
8	BGMP513	Language Lab	30				20		30	**50**	**2**
9	BGMT511	Character Designer MES/Q0502						Any one Training 400 hrs / 8 weeks		**150**	**12**
	BGMT512	Storyboard Artist MES/Q0507									
	BGMT513	Editor MES/Q1401									
Total			**610**							**500**	**24**

NSFQ Level 5 SEMESTER- II											
S. No.	**Subject Code**	**Subject**	**Total Teaching/ Training Hours**	**Evaluation Scheme**				**End Semester**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BGMV521	Pre-Production	30	10	5	5	20	30		**50**	**2**
2	BGMV522	Audio Editing	30	10	5	5	20	30		**50**	**2**
3	BGMV523	Video Editing	30	10	5	5	20	30		**50**	**2**
4	BGMV524	Communication Skill- II	30	10	5	5	20	30		**50**	**2**
6	BGMP521	Audio Editing-Lab	30				20		30	**50**	**1**
7	BGMP522	Video Editing-Lab	30				20		30	**50**	**1**
8	BGMP523	IT Tool Lab	30				20		30	**50**	**2**
9	BGMT521	Any one of the QP's can be opted as offered in Semester I						Any one Training 400 hrs/ 8 weeks		**150**	**12**
Total			**610**							**500**	**24**

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV631	Principles of Animation and Techniques of Animation	30	10	5	5	20	30		50	2
2	BGMV632	Basic of 3-D Modelling	30	10	5	5	20	30		50	2
3	BGMV633	Texture and Lighting	30	10	5	5	20	30		50	2
4	BGMV634	Communication Skill-III	30	10	5	5	20	30		50	2
5	BGME631	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BGMP631	Digital Animation with Flash - Lab	30				20		30	50	1
7	BGMP632	Maya – Lab	30				20		30	50	1
8	BGMT631	Modeller MES/Q2501						Any one Training 400 hrs/ 8 weeks		150	12
	BGMT632	Animator MES/Q0701									
	BGMT633	Rendering Artist MES/Q3503									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV641	3 D Animation	30	10	5	5	20	30		50	2
2	BGMV642	Introduction to 3 D Motion Graphics & VFX	30	10	5	5	20	30		50	2
3	BGMV643	Introduction to Rendering	30	10	5	5	20	30		50	2
4	BGMV644	Communication Skill-IV	30	10	5	5	20	30		50	2
5	BGME641	Env. &Eco./Uni. Human Values & ethics	30	10	5	5	20	30		50	2
6	BGMP641	3 D Animation Lab	30				20		30	50	1
7	BGMP642	Rendering-Lab	30				20		30	50	1
8	BGMT641	Any one of the QP's can be opted as offered in Semester III						Any one Training 400 hrs/ 8 weeks		150	12
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV751	Digital Compositing	30	10	5	5	20	30		50	2
2	BGMV752	3 D Texturing	30	10	5	5	20	30		50	2
3	BGMV753	Basic of Accounts-I	30	10	5	5	20	30		50	2
4	BGMV754	Computer Graphics	30	10	5	5	20	30		50	2
5	BGME751	Indian Constitution / Essence of Indian Traditional knowledge	30								2
6	BGMP751	Digital Compositing-Lab	30				20		30	50	1
7	BGMP752	3 D Texturing –Lab	30				20		30	50	1
8	BGMT751	Compositor MES/Q3505						Any one Training 400 hrs/ 8 weeks		150	12
	BGMT752	Texturing Artist MES/Q2503									
	BGMT753	Rigging Artist MES/Q2502									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BGMV761	Muscle System	30	10	5	5	20	30		50	2
2	BGMV762	Rigging	30	10	5	5	20	30		50	2
3	BGME761	Indian Constitution / Essence of Indian Traditional knowledge	30	10	5	5	20	30		50	2
4	BGMP761	Major Project	180					30	150	150	6
5	BGMT761	Any one of the QP's can be opted as offered in Semester V						Any one Training 400 hrs/ 6 weeks		200	12
Total			670							500	24

Detailed Curriculum

Software Requirements to run the B. Voc (Graphics and Multimedia)

1. Adobe Illustrator (Vector graphic design software)
2. Adobe Photoshop
3. Sound Forge
4. Adobe Premiere Pro
5. Autodesk 3DS Max
6. Autodesk Maya
7. ZBrush

Level 5 (Semester I)

Web Applications

Bridge Course

Introduction to Database Management

Introduction to database concepts and its need

Database Terminology: Data, Record/Tuple, Table, Database, field/attribute

Networking And Open Standards

Computer Networking: Evolution of Networking: ARPANET, WWW, Internet

Network Topologies: Bus, Star, Tree

Types of Network: PAN, LAN, WAN, MAN

Web Page Development

Review of HTML/DHTML, JavaScript covered in Class XI

Installation and Managing WEB-Server: IIS/XAMPP/LAMP

Movie Editing Tools.

1. Familiarization of interface components.
2. Importing pictures.
3. Importing Audio and Video Files.
4. Splitting and Joining Movie Clips.
5. Adding Titles and publishing.
6. Compatible Multimedia file formats for Web Pages.
7. Embedding Audio file.
8. Embedding Video file.
9. Embedding Flash file.
10. Java Script review.
11. Functions – user defined.

12. String Object.
13. Math Object.
14. Array Object.
15. Events.
16. Case Studies.
17. Advanced Features of Web Design.
18. Code view, Add-ins / Snippets and Page Transitions.
19. Dynamic Web templates.
20. SEO - Search Engine Optimization.
21. Forms - Advanced.
22. Publishing webpages or websites-I.

Reference Books:
1.Internet & Web Development, Soma Das Gupta, Khanna Publishing House

Communication Skill -I

Communication Process: The magic of effective communication; Building self-esteem andovercoming fears; Concept, nature and significance of communication process; Meaning, types andmodels of communication; Verbal and non-verbal communication; Linguistic and non-linguisticbarriers to communication and reasons behind communication gap/ miscommunication.

Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; phrases and clauses;Case: subjective case, possessive case; objective case; Correct usage of nouns, pronouns andantecedents, adjectives, adverbs and articles;

Reference Books:
1. Effective Commmunication Skills, Kulbhushan Kumar, Khanna Publishing House

Graphic Design(Basic Sketching and Human Anatomy in Drawing)

Bridge Course

Design Processes and Practices

Role of Design in Society, Functions of Design, Implications and Impact of Graphic Design Role of Graphic Designer , Contemporary Graphic Design in India , Graphic Design Processes Methodology of Graphic Design

Principles and Elements of Design

Sketching and Drawing, Introduction to Drawing: an aid in visual representation, Types of drawing
Drawing from memory and imagination
Drawing from observation
Drawing from Dimensional information, Virtues of drawing, Colour, Colours theories, Colour wheel, Colour Harmonies or Colour Schemes, Colour Symbolism

Media and Design

Digital Imaging and Printing,Types of Digital Images, Digital image Editing, Digital Printing Advertising Design, What is Media Planning, Campaign Design, Kinds of Campaign , Planning a Campaign Research & Data Collection

Unit I:

Orientation into visual art form. The Basics of traditional 2D animation, Introduction to the skill required thereof, beginning life drawing, Use of simple shapes. How to draw sketches with the help of basic shapes Learning to draw lines, circles, ovals, scribbles, zigzag (random) patterns etc. Background elements, trees, mountains, clouds, water bodies, meadows, perspective drawing Lights and shadows day night scenes, layers (concept and implementation) layout design and staging. An intro on how to make drawings for animation, shapes and forms, about 2D and 3D drawings, Caricaturing-fundamentals, Exaggeration, Attitude, Silhouettes, Boundary breaking exercises and warm-ups.

Unit II:

HUMAN ANATOMY: Structure of man, proportion of body parts, drawing from basic form, Line of action, balance Rhythm, turnings, twisting, drawing plane surfaces, torso, face, eyes, nose, ears, mouth, hand and feet.

FEMALE ANATOMY: Proportion and construction of female body, twisting of female body, chest, torso, face, parts of face, hands, hands in action, feet and gestures, curves, curls, rhythm and twist.

CHILD ANATOMY:Understanding child's figure, proportion and construction of child body, face, chubbiness, hand, feet and gestures.

ANIMAL ANATOMY: Animals from basic forms, understanding motion and grace of animals, turning animals to character, face, legs, tails, perspectives.

CARTOON ANATOMY: Understanding cartoon characters, drawing from basic shapes, line of action, distortion of proportion, cartoon faces, eyes, mouths, hairs, nose, hands, feet, gestures and poses.

Reference Books:

1. Internet and Web Technology, Soma Das Gupta, Khanna Publishing House

Illustrations and Photo Editing

UNIT – I

Introduction to Adobe Illustrator: Introduction to Adobe Illustrator, work area and workspaces and tools. Opening files, importing art work, viewing art work, rulers and grids, Drawing in Illustrator, drawing lines and shapes, pencil tool, pen tool, editing drawing, tracing, symbols, colouring, applying colours, swatches, adjusting colour and colour settings.

UNIT – II

Painting with Illustrator, fills, strokes, brushes, transparency, blending, gradient, meshes and color blending. Selecting, transformation, scaling, grouping, reshaping, cutting, blending of object, creating 3D object, text and typing, special effects, filters, shadows, glow, feathering graphic styles.

UNIT – III

Photoshop and its interface, Navigation and All tools, Working with basic selections, advanced selections-1(on the basis of channels, color range, extract, filter etc), Exercises on selections, Quick Masks, Layer Mask, Vector Mask, Layers & Layer Blending Modes, Play with Photoshop, Filter Gallery, Exercises, Bring some object and try to make it in computer, Make your own cartoon character.

Color Theory, Make a perfect cropping of some images using Photoshop, Prepare a cut-out of some images using Photoshop, Place nice background for those images, Prepare nice background using gradient tool, Scan various images, Color adjustment of those images (PHOTO RETOUCHING).

UNIT – IV

Make Nature scene (winter) digital painting, Make Nature scene (summer) digital painting. Make digital painting (Use brush, pencil, smudge etc), Make something like modern art keeping in mind color combination, make a collage of Indian art and culture. Make a collage of wildlife animals, Make a portrait of celebrity (Digital painting).Convert a B&W image into color (Use variation), "Choose a theme (Music, Festivals, Sports, Dance) and Design 5-8 graphics on them.", Color Modes, Color Corrections, Advanced color correction techniques (levels, Curves, Hue, Saturation etc), Design that Ad from your own style. Design motifs tribe art, Make an animal character, "Plan a story of that character & Make its backgrounds in three/four frames", Make posters on nature/earth, Matte Painting- Composition, Creating images for the web: Exporting images from Photoshop.

Reference Books:

1. Learning Illustrator, Ramesh Bangia, Khanna Publishing House

Web Applications Lab

- Movie Editing Tools
- Customizing and Embedding, Multimedia Components in Web Pages.
- Web Scripting - Java Script.

Illustration and Photo-Editing-Lab

- Script breakdown
- Storyboards
- Costume acquisition
- Sets and Properties design and sourcing
- Location recce and hire
- Location permissions and legal requirements, permissions from civic authorities
- Equipment requirements and bookings
- Travel and Transport
- Catering for crew
- Hospitality for out of town shoots

Level5 (Semester II)

Pre-Production

- Research, brainstorming & story concept creation: Intention / purpose & audience (what you intend to say & why)
- Story structure & character development: Narrative structure and character back story
- Sequence & shot analysis: Analysis and re-creation of timing and shot composition from professionally produced film/video productions
- Storyboards: Visual design (layout/composition, style, color, lighting etc.); Language of cinema (narrative structure, shot composition, spatial/directional continuity)
- Animatics / pre-viz: Timing and transitions Audio layering (music, ambient sound, narration) Budgeting and planning: Consideration of schedules, costs and other planning issues

Audio Editing

UNIT – I

Sonic Sound Forge: Manipulating audio: Auto trim/crop, mute, DC offset, resample, reverse, smooth/enhance, Fade in/out, insert silence, bit depth converter etc, understanding various digital audio formats like .WAV, .AIFF, .MP3, swf, WMA etc, understand audio plug-in, importing and exporting into multiple audio file formats like MP3, real audio, QuickTime formats, etc.

Event tool: move, split, slip and trim multiple events, create fades, apply ASR (Attack/Sustain/Release).Understanding script editor window, Spectrum analysis tools, scrub tool etc, statistics tool (Max, RMS, DC offset, zero crossings), sampler tool etc, Audio editing: workflow, real time editing, event based editing, waveform volume and pan envelopes, Edit, record, encode and master digital audio, editing audio by drag and drop options, cross fading audio tracks, balancing sound levels, creating smooth fades etc.

UNIT – II

Understanding Multichannel audio recording, synchronize audio and video. Understanding regions and play lists, editing of fields, name markers, loops, and regions, Timing basis: absolute frames, measures and beats, Time and frames. Audio effects like: Equalizer, Volume, chorus, distortion, Delay/echo, pitch, bend/shift, reverb, vibrato, normalize etc Insert track markers, adding multiple tracks, adjusting track time, musical instrument file processing

Reference Books:

1. Audio & Video Systems, Bali & Bali, Khanna Publishing House

Video Editing

- Adobe Premiere: Concept of non-linear editing,
- The basics of editing: Overview, Importing and Exporting: various audio, video and graphics in various formats, Edit, manipulate and arrange these elements in visual timeline, understand all Tools of toolbox for editing clips. Titling and superimposing.
- Panels: Tools panel, Project,
- Monitors: Source and program, Timeline, Audio meters,
- Misc. Tasks and functions: Titles, Transitions, speed and duration, Effects, Key frames, Types of edit, Opacity, trimming,
- Adding Special effects like: Star trek transporter effect, Blur part of an image, Ghost effect, Highlight part of an image etc.

Reference Books:

1. Audio & Video Systems, Bali & Bali, Khanna Publishing House

Communication Skill-II

Communication Process:

Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precise writing/abstracting/summarizing; Style of technical communication Curriculum vitae/resume writing;Innovative methods to enhance vocabulary, analogy questions.

Structural and Functional Grammar:

Agreement of verb with the subject: tense, mood,voice; Writing effective sentences; Basic sentence faults;

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

Audio Editing Lab

Using Editing Software – editing basics and implementation of various techniques used in non-linear editing. Mastering final edit line – audio levels, colour correction, audio mixing, mixed and un-mixed versions, importing and applying compatible graphics files. Understanding compression and its affects along with various methods.

Video Editing Lab

1. Assisting Production department on shoot
2. Assisting Direction department on shoot
3. Assisting Art department on shoot
4. Assisting Camera department on shoot
5. Assisting Sound department on shoot

Level 6 (Semester III)

Principles of Animation and Techniques of Animation

UNIT – 1

Drawings with the help of basic shapes, Animal study, Human anatomy, Shading techniques, Live model study, Introduction- Importance of confidence, Difference between "looking at the drawing" and "seeing the drawing", What is observation, Procedure- How to approach, Importance of Guideline- Line of action, Overcome the fear, Drawing for animation,

UNIT – 2

An Introduction on how to make drawings for animation, Shapes and forms, About 2d and 3d drawings, Caricaturing – fundamentals, Exaggeration, Attitude, Silhouettes, Boundary- breaking exercises and warm ups, gesture drawing, Line drawing and quick sketches, Drawing from observation, memory and imagination.

UNIT – 3

Drawing for Animation, Exercises and warm ups on pegging sheet, Quick Studies from real life, Sequential movement drawing, caricaturing the Action. Thumbnails, Drama and psychological effect,

Motion Studies, Drawing for motion,

UNIT – 4

The Body language, Re-defining the drawings, Introduction to animation production process, Basic Principles in animation, Squash and stretch, Anticipation, Staging, Straight ahead and pose to pose, Follow through and overlapping action, Slow in and slow out, Arcs, Secondary action, Timing, Exaggeration, Solid drawing, Appeal, Mass and weight, Character acting, Volume, Line of action, Path of action, Walk cycles-animal and human.

Reference Books:

1. Multimedia and Animation, V.K. Jain, Khanna Publishing House

Basic of 3-D Modelling

UNIT – I

Interface of 3DS max, Understanding the concept of four view ports, Aligning object in the each view port in X, Y, Z axis, Hot keys, User defined hot keys, Using the menus, Floating and docking. Command panel, customizing the interface, Using drag and drop feature, Introduction to different workspaces, "Geometry, Sub objects, Extruding, Welding, bridging etc, Recognizing the workspaces".

UNIT – II

Introduction to standard and extended primitives. "Introduction to creating complex objects with Standard and extended primitives", Understanding the spline tools. Introduction to polytools. Using modifier stack, navigating the modifier stack, File navigation, Introduction to Connection (Hierarchy, Group, and Link).

UNIT – III

Introduction to the 3d elevators and walk through, "Introduction to modifiers and modifier gizmos, Familiarity with Modifiers like Bend, edit poly, X form, wave, lathe symmetry etc

UNIT – IV

Advanced 3DS Max, Modelling objects with lathe, loft, extrude etc, Creating 3D objects from 2D spline shapes, Organic and inorganic modelling

Texture and Lighting

Unit I:

Introduction to texturing, working with Diffuse, Opacity and Reflection, Basics of UV unwrapping, Creating texture maps, Bump and Displacement Mapping, Introduction to Video post, Introduction to standard lights.

Reference Books:

1. Mastering Photoshop, WebTech Solutions, Khanna Publishing House

Communication Skills III

UNIT-I Recognizing and Understanding Communication Styles: What is Communication, Passive Communication, Aggressive Communication, Passive-Aggressive Communication, Assertive Communication, Verbal and Non Verbal Communication, Barriers and Gateways to Communication.

UNIT-II Listening Skills: Types of Listening (theory /definition), Tips for Effective Listening Academic Listening- (lecturing), Listening to Talks and Presentations, Basics of Telephone Communication Writing Skills: Standard Business letter, Report writing, Email drafting and Etiquettes, Preparing Agenda and writing minutes for meetings, Making notes on Business conversations, Effective use of SMS, Case writing and Documentation

UNIT-III Soft Skills: Empathy (Understanding of someone else point of view), Intrapersonal skills, Interpersonal skills, Negotiation skills, Cultural Aspects of Communication.

UNIT-IV Group Communication: The Basics of Group Dynamics, Group Interaction and Communication, how to Be Effective in Groups, Handling Miscommunication, Handling Disagreements and Conflicts, Constructive Criticism

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

Digital Animation with FlashLab

- Data management in postproduction.
- Setting up and preparing editing rooms and sound editing rooms
- Logging of rushes
- Assisting in rough cuts
- Assist in editing line-up
- Assist in synchronizing visuals and dialogue
- Assist in recording and matching sound effects

Maya Lab

- Navigate the Maya interface
- Access your objects in the Maya scene graph
- Use the Maya polygon and NURBS modeling tools
- Shade and apply texture maps to objects inside of Maya
- Union: Region belonging to one or both polygons
- Intersection: Region belonging to both polygons
- Difference: Region belonging to first but not second
- Polygon Texturing

Level 6 (Semester IV)

3D Animation

Unit I: Body Mechanics

Students learn to use principles of traditional animation within the context of 3D animation by effectively applying them onto the character.

Part of good acting for animation is planning. The students learn to create or collect authentic visual references (both still and video) for animating body mechanics and understanding acting. Good poses are not only essential to create believable physicality but also it helps to clearly convey the character emotion for storytelling. They learn the importance of balance and weight, checking the silhouette all the time to make clearer poses.

They learn to act out body mechanics, learn the effect of physics (gravity/friction etc.) and artistic Presentation (composition, staging, silhouette etc.)

Students learn to convey Emotion not only in the facial expression but also in the body language.

Unit II: Facial Expression and Lip Sync

Foundation of good facial expression depends upon the reference and pre-planning. Detailed expression chart and voice recording is used as a starting point for any facial animation. Students learn to internalize the dialogue and they rehearse the sounds to match the shapes. They also need to draw out key poses before starting to pose in 3D.
A good animator needs more skillset than just to be able to animate how to createlip-synch. Students explore how to create the subtle facial expressions to suit the personality of the character and the accent style of the pre-recorded dialogue.

Unit III: Animation and the Body
Exploration of the diverse ways in which the human form takes shape in animated films, from highly photorealistic representations to stream-of-consciousness movement. Specific examples from 2D, 3D, stop-motion and hybrid work will be examined in order to shed light on the construction and animation of the body in contemporary film.

Reference Books:

1. Multimedia and Animation, V.K. Jain, Khanna Publishing House

Introduction to 3 D Motion Graphics & VFX

UNIT – I

Concepts for Broadcast animation for logos, channel IDs and montages, Multi-layer compositing, Special effects, Super imposition and titling, Exporting various file formats outputs as per the end user requirements.

UNIT – II

Introduction to batch render & work group, Adding cameras & lights to a simple scene to make a complex compositing, Adding 2D back ground and elements into a 3D character layers, Creating object, material IDs for further adding special effects, Effects for digital video 2D layers and 3D layers for more effective outputs, adding particle effects into a scene.

UNIT – III

Introduction to colour character and keying, "Editing the real time video with CG based scene and merging both of them to create a final output, Exporting various file format, output as per the end user requirements.

UNIT – IV

Introduction to the batch rendering and work groups, Introduction to the concepts of editing in terms of compositing, Adding special effects in built in compositing software to make a simple shot into a perfect output.

UNIT – V

Chroma keying, Luma key, Blue screen, Key frame text & layer animation & 3D particles, Effects etc. Color correction, Introduction to 3D compositing concepts i.e. Layers and masking, Rot scoping, Rig removal, Morphing.

Reference Books:

1. Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House

Introduction to Rendering

Unit I:

This unit teaches students about rendering concepts; formats and resolutions.

Unit II:

This unit teaches students the advantages of different render software such as mental ray, v-ray, render man etc.

Unit III:

This unit teaches students the benefits of layer based rendering. This process enhances theimage quality without need of re-rendering the images again.

Unit IV:

The rendered layers or passes need to be composited to get the final output.

Communication Skills IV

Forms of non-verbal communication; interpreting body-language cues; Kinesics; Effective use of body language. The presentation and oral communication skill will be imparted through Group Discussion, Differences between group discussion and debate; Presentation Skills, Oral presentation and public speaking skills; The course also includes training and skill of Technology-based Communication, power-point presentation. Activities/tasks like role playing, group discussion, public speaking, extempore presentation and interviews will be conducted on regular basis.

Writing Skills: The activities will include: Writing Task: identifying the focus, generating ideas, outlining, etc. Paragraph Structure and Linking Sub-points in a Paragraph Cohesion and unity in a paragraph, Minding Punctuation and Proofreading, Summarising, Reviewing and Aspects of Creative Writing. Activities / tasks to be conducted like paragraph writing, essay writing, writing a review of a literary text, writing a summary of a literary text, comprehension and analysis of a literary text, preparing an advertisement.

Reference Books:

1. Effective Communication Skills, Kulbhushan Kumar, Khanna Publishing House
2. Business Communications, Varinder Bhatia, Khanna Publishing House

3D Animation Lab

- Assist in laying background music tracks
- Assist in mixing and mastering video
- Assist in creating titles and subtitles and basic animation sequences
- Understand and assist in the execution of modelling and rendering in 3D animation software.

3D Rendering Lab

Introduction to Scene, Preparing the Scene, Basic Settings for Texturing, Create & Assign Textures, Light Setup, V-Ray Rendering Settings

- Rendering with V-Ray
- V-ray light setup
- V-ray rendering settings
- HDRI Illumination
- Fine-tuning shadows
- Final render setting

Level 7 (Semester V)

Digital Compositing

- Introduction to Compositing software
- Principles of compositing
- Basic techniques
- Transparency
- Rotoscoping
- Wire Removal
- Chroma key
- Layer based compositing
- Compositing modes
- Animating layers

3D Texturing

UNIT – I

Introduction to basic material types & Procedurals. Study of concepts: Opacity, Smoothness, Specularity, and color, Working with Maya Surface Nodes-Blinn, Phong & Lambert, Working with Transparency, Reflection & Refraction, Bump & Displacement Maps, Introduction to unwrapping, Unwrapping the maps for various 3D characters.

UNIT – II

Working with 2D and 3D Texture, Introduction to the mapping and advanced texturing techniques, Shadow maps; ray traced shadows and radiosity, Creating photo real environments and textures, Basics of Utilities-Reverse, Stencil, Condition, Sampler Information.

Basic of Accounts-I

Chapter 1:

- Define the accounting process
- Describe the role of accountants
- Explain accounting concepts and principles
- Discuss the concept of the accounting equation
- Use the accounting equation to analyze basic transactions in terms of increases and decreases
- Reporting financial information on a balance sheet

Chapter 2:

- Determine how transactions change owner's equity in an accounting equation
- Reporting a changed accounting equation on a balance sheet

Chapter 3:

- Analyze transactions using T-accounts and using debits and credits
- Use debits and credits to record increase and decreases in accounts

Chapter 4:

- Record journal entries in a 5-column journal
- Define accounting terms related to journalizing transactions
- Prove and rule a five-column journal and prove cash

Chapter 5:

- Prepare a chart of accounts and opening accounts
- Post separate amounts from a journal to a general ledger
- Post column totals from a journal to a general ledger
- Make correcting entries

Chapter 6:

- Reconcile a bank statement and record bank service charges, dishonoured checks, and petty cash transactions

Computer Graphics

UNIT-I Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices. Output Primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood fill algorithms.

UNIT-II 2-D Geometrical Transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT-III 3-D Object Representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygonrendering methods.

UNIT-IV 3-D Geometric Transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D Viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping

Reference Books:

1. Computer Graphics, Rishabh Anand, Khanna Publishing House
2. Computer Graphics, Gautam Roy, Khanna Publishing House

Digital Compositing Lab

- 2D animation preproduction
- 2D character design
- 2D environment and background layout
- Motion graphic sequences

3D Texturing Lab

1. Applying Texture for inorganic polygon models- I

(Lamps, Mobile, Planet, Land with grass texture, rock, atmospheric objects system)

2. Applying Texture for organic polygon models – I (Cartoon, Semi cartoon)
3. Applying Texture for inorganic polygon models - II (Solar system, Car, Bike, Plane)
4. Applying Texture for organic polygon models - II (Human, Animal)
5. Applying Texture for organic Subdivision models – I (Cartoon, Semi cartoon)
6. Applying Texture for inorganic Subdivision models - II (Solar system, Car, Bike, Plane)
7. Applying texture for rendering final output with organic and inorganic objects

Level7 (SemesterVI)

Muscle System

Unit I:

Introduction to bone system/Joints and IK handles, creating bone system and maintaining naming conventions,

Unit II:

Skinning: types, import and export of skin weights, IK and FK basics, IK and FK switch, stretchy IK and FK,

Unit III:

Introduction to Deformers: attics, wrap, cluster, riggle, wire etc. Use of deformers in rigging process.

Rigging

UNIT –I

Introduction to constraints and implementation to rigging, Maintaining proper hierarchy, grouping and creating controls, Rigging the characters, Introduction to Muscle system, Working with Muscle rigging, Introduction to automated rigging systems and methods.

UNIT – II

"Embedding small scripts in the hierarchy control system, to save time and facilitate handling", Advanced rigging, Vertex weighting techniques, Rigging solutions to Anatomical Problems, Using advanced rigging to archive natural articulation of character.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.
Banking Finance Services and Insurance (FS)
Branch Code:108

Based on
AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME
Banking Finance Services and Insurance (BFSI)

BFSI Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BFSV511	Banking & Micro Finance - I	30	10	5	5	20	30		50	2
2	BFSV512	Indian Securities Markets - I	30	10	5	5	20	30		50	2
3	BFSV513	Micro Finance Operations - I	30	10	5	5	20	30		50	2
4	BFSV514	Mutual Fund Operations - I	30	10	5	5	20	30		50	2
5	BFSP511	Vocational Practical –I	30	-	-	-	20	-	30	50	1
6	BFSP512	Vocational Practical –II	30	-	-	-	20	-	30	50	1
7	BFSP513	Language Lab	30	-	-	-	20	-	30	50	2
8	BFST511	Insurance Agent (BSC/Q3801)						Any one Training 400hrs/ 8 weeks		150	12
	BFST512	Business Correspondent / Business Facilitator(BSC/Q8401)									
	BFST513	Debt Recovery Agent (BSC/Q2303)									
Total			610	-	-	-	-	-	-	500	24

BFSI Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BFSV521	Banking & Micro Finance – II	30	10	5	5	20	30		50	2
2	BFSV522	Indian Securities Markets - II	30	10	5	5	20	30		50	2
3	BFSV523	Micro Finance Operations - II	30	10	5	5	20	30		50	2
4	BFSV524	Mutual Fund Operations - II	30	10	5	5	20	30		50	2
5	BFSP521	Vocational Practical –III	30	-	-	-	20	-	30	50	1
6	BFSP522	Vocational Practical –IV	30	-	-	-	20	-	30	50	1
7	BFSP523	IT Tool Lab	30	-	-	-	20	-	30	50	2
8	BFST521	Mutual Fund Agent (BSC/Q3802)						Any one Training 400 hrs/ 6 weeks		150	12
	BFST522	Small and Medium Enterprise (SME) Officer (BSC/Q2302)									
Total			610	-	-	-	-	-	-	500	24

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS

For

B. Voc.

Electronics Manufacturing Services (EM)
Branch Code:111

Based on

AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

EVALUATION SCHEME
Electronics Manufacturing Services

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV511	Electronic Measurement and Instrumentation –I	30	10	5	5	20	30		50	2
2	BEMV512	Identification of Components, Tools, SOP & Work Instructions-I	30	10	5	5	20	30		50	2
3	BEMV513	Tools, Equipment & Safety Measures –I	30	10	5	5	20	30		50	2
4	BEMV514	Soldering & De-Soldering of Components –I	30	10	5	5	20	30		50	2
6	BEMP511	Identification of Components, Tools, Equipment and its working –Lab	30				20		30	50	1
7	BEMP512	Electronic Measurement and Instrumentation -I –Lab	30				20		30	50	1
8	BEMP513	Language Lab	30				20		30	50	2
8	BEMT511	Embedded Software Engineer (ELE/Q1501)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT512	Security System Service Engineer (ELE/Q4610)									
	BEMT513	Systems Analyst (ELE/Q8701)									
	BEMV511	Embedded Software Engineer (ELE/Q1501)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV521	Electronic Measurement and Instrumentation –II	30	10	5	5	20	30		50	2
2	BEMV522	Identification of Components, Tools, SOP & Work Instructions-II	30	10	5	5	20	30		50	2
3	BEMV523	Tools, Equipment & Safety Measures –II	30	10	5	5	20	30		50	2
4	BEMV524	Soldering & De-Soldering of Components & Emergency actions II	30	10	5	5	20	30		50	2
5	BEMP521	Soldering & De-Soldering of Components-Lab	30				20		30	50	1
6	BEMP522	Electronic Measurement and Instrumentation -II (Lab)	30				20		30	50	1
7	BEMP523	IT Tool Lab	30				20		30	50	2
8	BEMT521	Smartphone Assembly Inspector (ELE/Q4001)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT522	Business Development Executive (ELE/Q1101									
Total			610							500	24

NSFQ Level 6 SEMESTER- III											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV631	Fault analysis & Repairs	30	10	5	5	20	30		50	2
2	BEMV632	Good Manufacturing Concept & Practices – I	30	10	5	5	20	30		50	2
3	BEMV633	Electronics Devices Circuit –I	30	10	5	5	20	30		50	2
4	BEMV634	Electronics System Packaging and Manufacturing	30	10	5	5	20	30		50	2
5	BEMV635	Univ. Human Val. & Ethics / Environ & Eco	30	10	5	5	20	30		50	2
6	BEMP631	Electronics Devices Circuit –I Lab	30				20		30	50	1
7	BEMP632	Fault analysis & Repairs – Lab +	30				20		30	50	1
8	BEMT631	Field Engineer RACW (ELE/Q3105)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT632	Security System Service Engineer (ELE/Q4610)									
	BEMT633	Pre-Sales Solar Technical Support Engineer (ELE/Q5602)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV641	Good Manufacturing Concepts Practices–II	30	10	5	5	20	30		50	2
2	BEMV642	Manufacturing & Quality Norms	30	10	5	5	20	30		50	2
3	BEMV643	Good Manufacturing Concepts & Practices–III	30	10	5	5	20	30		50	2
4	BEMV644	Electronics Devices Circuit –II	30	10	5	5	20	30		50	2
5	BEMV645	Environ & Eco / Univ. Human Val. & Ethics	30	10	5	5	20	30		50	2
6	BEMP641	Electronics Devices Circuit –II Lab	30				20		30	50	1
7	BEMP642	Manufacturing Practices	30				20		30	50	1
8	BEMT641	Purchase Executive (ELE/Q5701)					Any one Training 400 hrs/ 8 week			150	12
	BEMT642	Quality Engineer (ELE/Q7901									
Total			610							500	24

NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV751	Valuation & Storage	30	10	5	5	20	30		50	2
2	BEMV752	Shelf Life, Ware House Operations Management & Material Transactions	30	10	5	5	20	30		50	2
3	BEMV753	Industrial Electronics Product Design	30	10	5	5	20	30		50	2
4	BEMV754	Pre-Production Activities	30	10	5	5	20	30		50	2
5	BEMV755	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BEMP751	Pre-Production Activities-Lab	30				20		30	50	1
7	BEMP752	Valuation & Storage-Lab	30				20		30	50	1
8	BEMT751	Product Engineer (ELE/Q4201)					Any one Training 400 hrs/ 8 weeks			150	12
	BEMT752	Incoming QC Technician (ELE/Q4401)									
	BEMT753	Assembly Supervisor (ELE/Q6305)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BEMV761	Entrepreneurship/Accounting/Management	30	10	5	5	20	30		50	2
2	BEMV762	Trouble shooting and Maintenance of Electronics Equipment	30	10	5	5	20	30		50	2
3	BEMV763	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BEMP761	Major Project	180						150	150	6
5	BEMT761	FPGA Design Engineer (ELE/Q8201)					Any one Training 400 hrs/ 8 weeks			200	12
	BEMT762	Sales Executive-Consumer Electronics (ELE/Q3201)									
Total			670							500	24

Detailed Curriculum
Level 5 (Semester I)

Electronic Measurements and Instrumentation-I

Unit, dimensions and standards

Scientific notations and metric prefixes, SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multi-meters, digital frequency meter system.

Electromagnetic Effects

Permanent magnets and Electromagnets, their construction and uses, Polarities of an electromagnet and rules for finding them, Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance. Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Principles and construction of dynamo.

A.C Circuits

Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value R.M.S. value, form factor, crest factor, Phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

Identification of Components, Tools, SOP & Work Instructions-I

1. Main components & modules/ sub-assemblies of electronic equipment
    - Control Panel (System Controller)
    - Keypads
    - Door and Window Contacts
    - Motion Detectors
    - Glass Break Detection
    - Smoke Detectors
    - Heat Sensors
    - Carbon Monoxide Detectors
    - Water Detectors (or Water Bug)
    - Temperature Sensors
    - Capacitance switches / control push buttons & rotary switches

2. Introduction to Basic Electricity

Current Electricity

Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Temperature variation of resistance, Difference between AC and DC voltage and current.

D.C. Circuits
Ohm's Law, Series – parallel resistance circuits, calculation of equivalent resistance, Kirchhoff's Laws and their applications.

Electric Cells
Primary cell, wet cell, dry cell, battery, Li-ion battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, preparation of electrolyte, care and maintenance of secondary cells.

Lighting Effects of Current
Lighting effect of electric current, filaments used in lamps, and Tubelight, LED, their working and applications.

Capacitors
Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

3. **Introduction and Identification of Electronics Components**
   - Electronic controls in a common way
   - Diode, Transistors, Op-Amp
   - Number systems and Boolean Algebra
   - Logic Gates
   - Flip-Flops
   - Counters
   - Multiplexers
   - Decoders
   - LED, LCD and 7 segment display
   - RAM and ROM
4. Concept of Amplification factor, Gain & Signal distortion
5. Protocols like TCP/IP for communication purpose and for digital networks & circuits.

Tools, Equipment and Safety Measures-I

1. Cables & Connectors
   - Non-Metallic Sheathed Cable
   - Un grounded & Grounded Power Supply Cable
   - Metallic Sheathed Cable
   - Multi-Conductor Cable
   - Coaxial Cable
   - Unshielded Twisted Pair Cable
   - Shielded twisted pair cable
   - Ribbon Cable
   - Armoured & Unarmoured Cable
   - Twin-Lead Cable
   - Twin axial Cable
   - Optical fiber cable
   - Connectors
1. ESD Clothing
   - What to wear, how to wear

Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

Identification of Components, Tools, SOP & Work Instructions-I (Lab)

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.
6. Verification of truth tables for AND, OR, NOT and NAND logic gates.
7. Verification of truth tables for NOR, XOR and XNOR logic gates.
8. Construction and verification of operations of half adder and full adder circuits using basic gates.
9. Study and verification of truth tables for 3 line to 8 line decoder.
10. Study and verification of truth tables for 4:1 MUX using gates
11. Study and verification of truth tables for 1:4 DEMUX using gates.
12. Construction and verification of truth tables for S-R, D and J-K flip flops.
13. Study and verification of truth table for universal shift register.
14. Study the operation of a synchronous counter.

Electronic Measurement and Instrumentation -I (Lab)

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.

Level 5 (Semester II)

Electronic Measurements and Instrumentation - II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter
CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

Identification of Components, Tools, SOP & Work Instructions-II

1 Introduction to wireless communication
2 Signal Converters
3 Tools & their Uses
- Use of tester to monitor AC Power
- Skin the electrical wires/cables using the wire stripper and cutter
- Main cable for control & electronic circuit wires
- Crimping tools and buses

4 Introduction to measuring equipment's
- Signal generator's
- CRO
- Function Generators
- Frequency Counter
- Logic analyzer
- Spectrum analyzer
- LCRQ Meter

5 Standard Operating Procedures and Work Instructions
- What is SOP and WI
- How to read & follow SOP and WI
- Overall Quality Assurance Plan

Tools, Equipment & Safety Measures-II

1. Tools & Equipment
   - Types of tools & equipment required and deployed in manufacturing, installing & servicing
   - Identification and termination process
   - General maintenance of tools/equipment and recalibration of Test equipment
   - General safety and common-sense safety
2. PPE
   - Usage & benefits of PPE

- Types & usage of various PPE
- Maintenance of PPE

2. Clean Room Environment
   - Do's and Don't
   - Shop Floor Discipline

Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components
   - Identification of 2, 3, 4 terminal SMD components
   - Soldering the SMD components on the PCB
   - Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
   - Identify various connections and the setup required for SMD soldering station
   - De solder the SMD components from the given PCB
   - Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
   - Make a panel board using different types of switches for a given application
   - Identification of crimping tools for various IC packages
   - Reliable Soldering Practices

2. Emergency actions
   - Minimum Requirements
   - Reporting Emergencies
   - Emergency exits
   - Primary and secondary evacuation routes
   - Locations of fire extinguishers
   - Fire alarm pull stations' location
   - Assembly points
   - Medical Services

Soldering & De-soldering of components - II Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

Electronic Measurement-II Lab

1. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Pressure transducer
2. Measurement of phase difference and frequency using CRO (lissajous figure)
3. Measurement of low resistance Kelvin's double bridge.
4. Radio Receiver Measurements

Level 6 (Semester III)
Fault Analysis & Repairs

1. Classification of fault
2. Identification of fault
3. Rectification of fault
4. Repairing/Replacing Module
5. Analysis for the different types of equipment's
   - Smartphones
   - Air Conditioning
   - Security systems
   - Electronically controlled doors
6. Fault analysis based on hardware and software component
7. Diagnostic and Testing Methods
8. Visual Inspection
9. Earth Continuity Test
10. Insulation Resistance Test

(6.GV.02) Good Manufacturing Concept & Practices – I

- TQM (Total Quality Management) & Kaizen
- Inventory Management & Logistics in brief
- Quality assurance
- Checklist
- SWOT analysis
- Lean Manufacturing
- Muda, Mura & Muri – Toyota Production System (TPS)
- Spatial considerations & other related concepts

Electronics Devices & Circuit-I

Unit I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism. Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions. Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode. Introduction to Thyristors, PNPN diode, SCR, LASCR, DIAC, TRIAC

Electronics System Packaging and Manufacturing

Evolution and Classification of Printed Circuit Boards, Challenges in Modern PCB Design and Manufacture, PCB fabrication methodologies (SSB, DSB and multilayer board), PCB design considerations/ design rules for analog, digital and power applications, Electromagnetic

interference in electronic systems and its impact. Analysis of electronic circuit from noise emission point of view (both conducted and radiated emission) cross talk and reflection behavior of the circuit in time domain, Thermal management of electronic devices and systems.

Semiconductor Packages: Single chip packages or modules. (SCM) Commonly used packages and advanced packages; Materials in packages, Current trends in Packaging, Multichip modules (MCM)-types; System-in package (SIP); Packaging roadmaps; Hybrid circuits. Pipe and FIFOs, Shared memory, Sockets

Electronic Devices and Circuits Lab

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. Study CE configuration for NPN and PNP transistors and measurement of voltage and current gain.
7. Study CB configuration for NPN and PNP transistors and measurement of voltage and current gain.
8. Study CC configuration for NPN and PNP transistors and measurement of voltage and current gain.

Fault Analysis & Repairs - Lab

1. Categorization of faults
   - Hardware/Software, User Induced, Component Failures
   - L0 to L4 repairs
2. Testing electrical/electronic components in the product
3. Troubleshoot and repair of the faults identified in the product
   - Microphone
   - Musical Instruments (Loudspeakers)
   - Recorder (CD/ DVD Player)
4. Preventive Maintenance Services
5. Basic Occupational Safety and Precautions
6. Microphones and Loudspeakers

Level 6 (Semester IV)

Good Manufacturing Concepts & Practices – II

- Work Study Concepts
  - Method study
  - Work measurement
  - Sequencing of Operations and timing the flow steps
  - Advantages of work study

- Team Working
  - Forming
  - Storming
  - Norming
  - Performing
  - Adjourning

Manufacturing & Quality Norms

1. Manufacturing & Quality Norms- keep it differently according to all applications
   - Manpower Deployment and Operations as per Work Instructions and criticality of the process Understanding how to form each operation and practical training of operation
   - Understanding accept and reject criterion of a particular operation. Practical training of testing/checking each operation
   - Quality Norms of accept and practical training of electronic equipment's/Devices
   - Acceptance/ Rejection training of various defects

2. Manufacturing & Quality Norms – II
   - Process in packing line-Packing line Operations sequence flow and its importance
   - Quality Systems - Accept, Reject criterion of various tests at OQA
   - Training of Assembly of electronic components - Assemble, Check, test electronic components
   - Various Labels and their Importance - Understanding Labels, Scanning and its importance
   - Packing of components/devices - Various Stages of packing
   - Acceptance, Reject and sampling following QA norms - AQL level, Sampling techniques, as per QA sampling accept, reject numbers

Good Manufacturing Concepts & Practices – III

1. Good Manufacturing Concepts & Practices - II
   - Brief Introduction
   - Total Quality Management
     - ISO Standards
   - Kaizen
   - Toyota Production System

- Lean Manufacturing
  - Combination of Inventory
  - Supply Chain
- Quality and Inspection
  - 3 Sigma and 6 Sigma Orientation

Electronic Devices and Circuits –II

UNIT I MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT II BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT III Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator

Electronic Devices and Circuits –II Lab

1. Characteristic of BJT: BJT in CE configuration- Graphical measurement of hparameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
2. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
3. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
4. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
5. Oscillators: Sinusoidal Oscillators a. Wein's bridge oscillator b. phase shift oscillator.

Manufacturing Practices

1. Work study concepts
2. Team work concepts

Level 7 (Semester V)

Valuations & Storage

1. Valuation
    - Specific Item cost
    - Weighted average cost
2. Storage
    - Stacking Norms
    - Bin Cards
    - Stores Layout
    - Categorization of Materials
        - Hazardous/Non-Hazardous
        - Imported/Local
        - Assembly/ Parts
        - Consumables
        - Class A/B/C
        - Good/defective

Shelf Life, Ware House Operations Management & Material Transactions

1. Shelf Life Management
    - FIFO
    - FILO
    - LIFO
    - LILO

2. Material Transactions
    - Inward
    - Outward
    - Suspense
    - RMA (Return Material Authorization)
    - Insurance

Industrial Electronic Product Design

Development Process, Product Planning & Conceptualization, Product Architecture and Industrial Design, Product Manufacturing & Prototyping, Economic Analysis & Managing Projects. Introduction to 3-D printing and Rapid Prototyping

Pre-Production Activities

Pre-Production activities
- Layout
- Time Study & Motion Study
- Two Hand Insertion
- Non-value adding activities
- Positioning of Bins
- Line Balancing

Pre-Production Activities Lab

- Pre-Production activities
  - Two Hand Insertion
  - Positioning of Bins

- House Keeping
- 5S

Valuations & Storage Lab

- Categorization of Raw Material & Consumables
  - Hazardous/Non-Hazardous
  - Imported/Local
  - Assembly/Parts
  - Class A/B/C
  - Good/defective

- Material Transactions
  - Inward
  - Outward
  - Suspense

Level 7 (Semester II)

Accounting & Management/ Entrepreneurship

1. Introduction
Meaning and Nature of Management, Management Approaches, Processes, Managerial Skills, Tasks and Responsibilities of a Professional Manager.

2. Organizational Structure and Process
Organizational Culture and Climate, Managerial Ethos, Organization Structure & Design, and Managerial Communication.

3. Planning and Controlling
Planning Types and Process, Management by Objectives, Decision-Making Types and Models, Problem Solving Techniques, Controlling: Process and Techniques.

4. Performance Evaluation Techniques:
Introduction to Budgeting and Budgetary Control; Performance Budgeting; Classification of Budget; Standard Costing and Variance Analysis; Balanced Scorecard; Responsibility Accounting.

5. Decision Making Techniques:
Cost Volume Profit Analysis; Management Accounting for Decision Making and Control; EVA and Performance Measurement; Introduction to Activity Base Costing, Targeting Costing, Life Cycle Costing; Uniform Costing.

Or

Course Contents:

1. Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

2. Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search and Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

3. Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

4. Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD;

State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies-At least 4 (four) in whole course

Trouble Shooting & Maintenance of Electronics Equipment's-II

1. TV System

- Working principle with block diagram of TV transmitter and receiver, Brief description with circuit diagram: TV Tuner, Video IF stage, Sound stage, Picture tube & its associated circuit, Synchronizing circuits, Horizontal & vertical deflection circuits, Remote control of a TV receiver, Idea of bandwidth, blanking and synchronization pulses, modulation scheme, colour transmission.
- Cable type TV system, Head end processor, Trunk & cable distribution system with block diagram, Scrambling.
- Introduction to LCD and LED TV systems, Introduction to high definition systems. Steps for Fault finding & Analysis.

2. Modern Appliances

- Working principle and block diagram of following: Microwave oven, Telephone, Fax machine, Printers, Scanners. Steps for Fault finding & Analysis.

Project Work

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

STUDY, EVALUATION SCHEME & SYLLABUS
For
B. Voc.
Medical Imaging Technology(MI)
Branch Code:112

Based on
AICTE Model Curriculum

(EFFECTIVE FROM THE SESSION: 2019-20)

1. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of Medical Imaging Technology so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired.

A. Understanding of

(a) The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Biology) so that he/she is able to understand the different vocational subjects.
(b) The basic concepts in engineering drawing.
(c) The concepts, principles of working of basic electronic devices and circuits.
(d) The knowledge of procedures of medical imaging.
(e) The procedure of operation and upkeep of Medical Imaging equipments.
(f) The concepts and principles used in safety while using equipments.

B. Adequate Professional Skills and Competencies in

(a) Testing different electronic components.
(b) Testing the performance of electronic circuits.
(c) Locating the fault at component level and at the stage level.

C. A Healthy and Professional Attitude so that He/She has

(a) An analytical approach while working on a job.
(b) An open mind while locating/rectifying faults.
(c) Respect for working with his/her own hands.
(d) Respect for honesty, punctuality and truthfulness.

Curriculum

Semester-I(NSQF Level-5)											
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV511	Electronic Measurement and Instrumentation -I	30	10	5	5	20	30		50	2
2	BMIV512	Basic Anatomy (Cross Sectional Anatomy-II)	30	10	5	5	20	30		50	2
3	BMIV513	Tools, Equipment & Safety Measures –I	30	10	5	5	20	30		50	2
4	BMIV514	Soldering & De-Soldering of Components –I	30	10	5	5	20	30		50	2
5	BMIP511	Identification of Components, Tools, Equipment and its working –Lab	30				20		30	50	2
6	BMIP512	Basic diagnostics (Lab)	30				20		30	50	2
7	BMIP513	Language Lab	30				20		30	**50**	**2**
8	On-Job-Training (OJT)/Qualification Packs		400hr/8 weeks							150	12
	Total		580							500	24

Semester-II(NSQF Level-5)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV521	Electronic Measurement and Instrumentation –II	30	10	5	5	20	30		50	2
2	BMIV522	Basic Imaging	30	10	5	5	20	30		50	2
3	BMIV523	Tools, Equipment & Safety Measures –II	30	10	5	5	20	30		50	2
4	BMIV524	Soldering & De-Soldering of Components & Emergency actions II	30	10	5	5	20	30		50	2
5	BMIP521	Soldering & De-Soldering of Components-Lab	30				20		30	50	2
6	BMIP522	Basic Imaging Practical Lab	30				20		30	50	2
7	BMIP523	IT Tool Lab	30				20		30	50	2
8	**On-Job-Training (OJT)/Qualification Packs** (To continue with the same QP as opted in Level 5 First semester)		400hr/8 weeks							150	12
	Total		580							500	24

Semester-III(NSQF Level-6)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV631	Fault analysis & Repairs	30	10	5	5	20	30		50	2
2	BMIV632	Cross Sectional Anatomy-II	30	10	5	5	20	30		50	2
3	BMIV633	Electronics Devices Circuit –I	30	10	5	5	20	30		50	2
4	BMIV634	Radiation and administrative Issues	30	10	5	5	20	30		50	2
5	BMIP631	Electronics Devices Circuits Lab	30				20		30	50	2
6	BMIP632	Fault analysis & Repairs - Lab	30				20		30	50	2
7	BMIP633		30				20		30	50	2
7	**On-Job-Training (OJT)/Qualification Packs** Assistant Duty Manager - Patient Relation Services (HSS/Q6103)		400hr/8 weeks							150	12
	Total		580							500	24

Semester-IV(NSQF Level-6)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV641	CT and Ultrasound	60	20	10	10	40	60		100	4
2	BMIV642	Manufacturing & Quality Norms	30	10	5	5	20	30		50	2
3	BMIV643	Electronics Devices Circuit –II	30	10	5	5	20	30		50	2
4	BMIP641	Electronics Devices Circuit –II Lab	30				20		30	50	2
5	BMIP642	Manufacturing Practices	30				20		30	50	2
6	BMIP643		30				20		30	50	2
7	**On-Job-Training (OJT)/Qualification Packs** (To continue with the same QP as opted in Level 6 First semester)		400hr/8 weeks							150	12

	Total	580							500	24

Semester-V(NSQF Level-7)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV751	MRI, Image Processing and Recording	60	20	10	10	40	60		100	4
2	BMIV752	Advanced Imaging	60	20	10	10	40	60		100	4
3	BMIP751	MRI, Image Processing and Recording	30				20		30	50	2
4	BMIP752	Advanced Imaging	30				20		30	50	2
5	**On-Job-Training (OJT)/Qualification Packs** (Duty Manager - Patient Relation Services (HSS/Q6104))		400hr/8 weeks							200	12
	Total		580							500	24

Semester-VI(NSQF Level-7)										
S. N.	**Code**	**Subject**	**Total Teaching/ Training Hours**	**Internal Evaluation Scheme**				**End Sem**		**Total**	**Credit**
				CT	**TA**	**AT**	**Total**	**TE**	**PE**		
1	BMIV761	Admin, Medico Legal and interventional Procedures	60	20	10	10	40	60		100	4
2	BMIV762	Project	60	20	10	10	40	60		100	4
3	BMIP761	Admin, Medico Legal and Interventional Procedures	60				40		60	100	4
4	**On-Job-Training (OJT)/Qualification Packs** (The practical and theory need to be performed in a hospital/radiological centre) To continue with the same QP as opted in Level 7 First semester		400hr/8 weeks							200	12
	Total		580							500	24

Detailed Curriculum(Semester I)

Electronic Measurements and Instrumentation-II

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.
PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter
Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system.

Basic Anatomy (Cross Sectional Anatomy-II)

1. Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax and mid thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels, Lungs, heart and great vessels, Esophagus
3. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels
4. Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems
5. Neuro Anatomy- Scan planes
6. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
7. Spine- Vertebra and disc, Spinal cord and meninges
8. Neck- Arterial/venous systems, Muscles, Glands and pharynx

Tools, Equipment and Safety Measures-I

1. **Cables & Connectors**
   - Non-Metallic Sheathed Cable
   - Un grounded & Grounded Power Supply Cable
   - Metallic Sheathed Cable
   - Multi-Conductor Cable
   - Coaxial Cable
   - Unshielded Twisted Pair Cable
   - Shielded twisted pair cable
   - Ribbon Cable
   - Armoured & Unarmoured Cable
   - Twin-Lead Cable
   - Twin axial Cable
   - Optical fiber cable
   - Connectors
2. **ESD Clothing**
   - What to wear, how to wear

Soldering & De-Soldering of Components-I

1. Soldering & De Soldering of Basic Components
   - Soldering Tools
   - Different types of Soldering Guns related to Temperature and wattages, types of tips
   - Solder materials and their grading
   - Soldering and De Soldering Stations and their Specifications
   - Preparing Component for Soldering
   - PCB Applications
   - Types of PCB
   - Soldering Basic Components on PCB
   - De soldering Basic Components
   - Safety precautions while Soldering & De soldering
   - Check for cold continuity of PCB
   - Identification of loose/dry solder, broken tracks on printed wire assemblies & discrete components mounted circuit boards
   - Join the broken PCB track and test
   - De soldering using Pump and wick
   - Introduction of SMD Components

Identification of Components, Tools, Equipment's & working – Lab

1. Identification & working of various electronic components
2. Working of testing equipment
3. Measurement using Multimeter & Clamp meter
4. Battery health check-up
5. Measure and test the voltage of given cells.

Basic Diagnostics (Lab)

1. **X–Ray Imaging**
   - X–Ray Tubes.
   - Stationary & Rotation Anode.
   - X–ray Consolestation (Demo of KV, MA and exposure time settings).
   - Procedures to reduce Scattered Radiation.
   - Focus Principle.
   - Grids.
   - Screen.
   - Image intensifiers.
   - Use of contrast materials.

2. **Dark Room Technique**
   - Images to ring devices.
   - Film cassette construction.
   - Duplicating a films
   - Spectrum.
   - Films types - Specialized use.
   - Operation, storage.
   - Photo chemistry.
   - Development.
   - Fixing.
   - Radiation protection, counters.
   - Assessment.

3. **Radiological Positioning**
   - Patient transfer technique.
   - Turning the patient.
   - Restraint techniques - Trauma, Pediatric, Geriatric, physically handicapped, disturbed patients, an aesthetized patient, moving chair & stretcher patients.
   - Tubes & catheters, Nasogastric, chest, Urinary, intravenous, oxygen & other (Castsurgical & cardiac) Alcoholic, bed pans & urinals.
   - Assessment.

(Semester II)

Electronic Measurements and Instrumentation – II

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications

Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

Basic Imaging

1. **The photographic Process:** Introduction, visible light, images produced by radiation, light sensitive photographic materials.
2. **Image Characteristic:** Real and mental images, reflected, transmitted and emitted light images Photographic emulsions. The photographic latent image. Positive process
3. **Film materials in X-ray:** History, structure of an x- ray film, single and double emulsion films, types of films, cross over effect.
4. **Spectral sensitivity** of film material, graininess of film material, speed and contrast of photographic materials.
5. **Sensitometry:** Photographic density, characteristic curves, features of the characteristic curve.
6. **Intensifying screens and cassettes.** Cassette design, care of cassettes, types of cassettes, and mounting of intensifying screens, loading and unloading of cassettes, Care of intensifying screens, tests to check screen film contact and lightleakage.
7. **The fluorescent materials,** types of intensifying screens, intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed, size of the crystals, reciprocity failure, and quantum mottle.
8. **Film processing:** Development. The nature of development-manual or automatic. The PH scale, constitution of developing solutions both in manual and automatic processing and properties of developing chemicals, development time, factors in the use of a developer, developer activity.
9. **Dark Room:** Layout and planning. Dark room construction - Nature of floor, walls, ceiling and radiation protection, Dark room equipment and its layout. Location of pass through boxes or cassette hatches.
10. **Radiographic Image:** Components in image quality-density, contrast and detail.
11. **Photo Fluorography:** Cine cameras, cine fluorography, cine film, serial cameras, processing of cine films, flurographic films.

Tools, Equipment & Safety Measures-II

1. Tools & Equipment
   - Types of tools & equipment required and deployed in manufacturing, installing & servicing
   - Identification and termination process
   - General maintenance of tools/equipment and recalibration of Test equipment
   - General safety and common-sense safety
2. PPE
   - Usage & benefits of PPE
   - Types & usage of various PPE
   - Maintenance of PPE
3. Clean Room Environment
   - Do's and Don't
   - Shop Floor Discipline

Soldering & De-soldering components & Emergency actions

1. Introduction to SMD Components

- Identification of 2, 3, 4 terminal SMD components
- Soldering the SMD components on the PCB
- Make the necessary settings on SMD soldering station to solder various ICs of different packages by choosing proper clamping tools
- Identify various connections and the setup required for SMD soldering station
- De solder the SMD components from the given PCB
- Make the necessary settings on SMD soldering station to de solder various ICs of different packages by choosing proper clamping tools
- Make a panel board using different types of switches for a given application
- Identification of crimping tools for various IC packages
- Reliable Soldering Practices

2. Emergency actions

- Minimum Requirements
- Reporting Emergencies
- Emergency exits
- Primary and secondary evacuation routes
- Locations of fire extinguishers
- Fire alarm pull stations' location
- Assembly points
- Medical Services

Soldering & De-soldering components – Lab

1. Assemble the product
2. Dis-assemble the product
3. Safety Precautions & emergency plans

Basic Imaging Practical's Lab

1. Test to check the x-ray films and screen contact in the cassette
2. Test to check light leakage in the cassette.
3. To check the effect of safe light on exposed as well as unexposed x-ray film

IT Tools Lab.

1. Spreadsheets, Word, Presentation
2. Multimedia Design
3. Troubleshooting
4. Project / Practical File
5. Viva Voce

(Semester III)

Fault Analysis & Repairs

1. Classification of fault
2. Identification of fault
3. Rectification of fault
4. Repairing/Replacing Module
5. Analysis for the different types of equipment's
   - Smartphones
   - Air Conditioning
   - Security systems
   - Electronically controlled doors
6. Fault analysis based on hardware and software component
7. Diagnostic and Testing Methods
8. Visual Inspection
9. Earth Continuity Test
10. Insulation Resistance Test

Cross Sectional Anatomy-II

1. Introduction to Sectional Anatomy & Terminology- Sectional planes, Anatomical relationships/terminology
2. Anatomy of the upper thorax- Surface anatomy relationships, Bony structures and muscles, Blood vessels.
3. Divisions of the mid-thorax, heart and great vessels- Lungs, heart and great vessels, Esophagus
4. CT/MRI Images of the Thorax - Normal and pathologic
5. Anatomy of the Abdomen- Major organs and their accessories, Abdominal blood vessels
6. CT/MR Images of Abdomen - Normal and pathologic
7. Anatomy of the Pelvis- Bony structures and associated muscles, Digestive and urinary systems
8. Reproductive Organs
9. CT/MR Images of the Male/Female Pelvis- Normal and pathologic
10. Neuro Anatomy- Scan planes
11. Brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
12. Spine- Vertebra and disc, Spinal cord and meninges
13. Neck- Arterial/venous systems, Muscles, Glands and pharynx

Electronics Devices Circuit-I

Unit I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism. Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions. Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

Radiation & Administrative Issues

1. **Quality Assurance:** General principles and preventive maintenance for routine, daily, weekly, monthly, quarterly, annually – machine calibration. Basic concepts of quality assurance, Radiation proof test; Resolution test; Phantom measurements - CT, US and MRI, Sensitometry, State and local regulations governing radiation protection practice.
2. **Maintenance and care of equipment:** Safe operation of equipment, Routine cleaning of equipment and instruments, Cassette, screen maintenance, Maintenance of automatic processor and manual processing units, Routine maintenance of equipment.
3. **Radiation protection:** Somatic and genetic radiation effects, Basis for occupational exposure limits, Ionizing radiation from natural and man-made source and their approximate dose equivalent contribution. Legal and ethical radiation protection responsibilities of radiation workers.
4. **Units detection and measurement:** Units of radiation for exposure, absorbed dose, dose equivalent, and radio- activity, Quality factor to determine the doseequivalent.
5. **Radiation detection devices:** Ion-Chambers, Proportional counter, Thermo-luminescent dosimeters (TLD), Appropriate application and limitation of each radiation detection device.
6. **Personal monitoring and occupational exposures:** Monitoring devices, Body badges and ring badges. Thermo-luminescent dosimeters. Pocket ionization chambers. Applications, advantages and limitations of each device, Values for dose equivalent limits for occupational radiation exposures. Structures critical for potential life effect for whole body irradiation. Age proportion formula for the determination of a maximum accumulated dose equivalent.
7. **Patient Protection:**
   Relationship of beam limiting devices with radiation protection of patients, Added and inherent filtration, Purpose and importance of patient shielding, Patient shielding devices and radiographic procedures shielding to the radiographic procedures, Protection of women at child- bearing age, Methods to avoid repeat radiographs, Importance of clear, concise, instruction (effective communication skills) as a method of radiation protection, Effects of immobilization techniques to eliminate voluntary motions
8. **AERB specifications:** Radiation safety (lead glass equivalence, lead lined doors) - room size - type approval – registrations & licenses - selection of exposure parameter for

various protocols – diagnostic reference levels.

Electronic Devices and Circuits Lab

1. Study of Lab Equipments and Components: CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. P-N Junction diode: Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance.
5. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.

Fault Analysis & Repairs – Lab

1. Categorization of faults
   - Hardware/Software, User Induced, Component Failures
   - L0 to L4 repairs
2. Testing electrical/electronic components in the product
3. Troubleshoot and repair of the faults identified in the product
4. Preventive Maintenance Services

(Semester IV)

CT and Ultrasound

1. Computed Tomography (CT)

- **Basic Computed Tomography**: Basic principles of CT, generations of CT, CT instrumentation, image formation in CT, CT image reconstruction, Hounsfield unit, CT image quality, CT image display
- **X-ray tube:** Construction working and limitations, generations, methods of cooling the anode, anode rating chart, speed of anode rotation, angle of anode inclination, Focus, anode heel effect, Effect of variation of anode voltage and filament temperature, inherent filter and added filter, bow tie filter, effect on quality of the spectrum.
- **Collimator designs**: Pencil beam, Fan beam, Cone beam CT, Z-axis collimation, detector design – construction and working - Gas filled detectors – solid state detectors – flat panel detectors.
- **Principles of tomography**: advantages and limitations – generations – spiral CT – slip ring technology - Multislice CT – dual source CT - pitch – rotationtime.
- **Basic principles of Image Reconstruction:** Back projection, analytical an iterative methods – MPR – MIP – volume rendering – surface shaded display (SSD) – bone reconstruction.
- **CT artefacts:** motion artefacts, streak artefacts, ring artefacts, partial volume artefacts etc. causes and remedy.
- **Dose and Dosimetry:** CT Dose Index (CTDI, etc.), Multiple Scan Average Dose (MSAD), Dose Length Product (DLP), Dose Profile, Effective Dose, Phantom Measurement Methods, Dose for Different Application Protocols, Technique Optimization
- **Advanced Computed Tomography:** Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beam geometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose, patient preparation, Imaging techniques and protocols for various parts of body, CT contrast enhanced protocols – CT angiography – (Aortogram, selective angiogram head, neck and peripheral) image documentation and Filing, maintenance of equipment and accessories.
- **Technical Assessment and Equipment Purchase Recommendations**

2. Ultrasonography

- **Basic Acoustics, Ultrasound terminologies:** acoustic pressure, power, intensity, impedance, speed, frequency, dB notation: relative acoustic pressure and relative acoustic intensity.
- **Interaction of US with matter:** reflection, transmission, scattering, refraction and absorption, attenuation and attenuation coefficients, US machine controls, US focusing.
- **Production of ultrasound:** Piezoelectricity, Medical ultrasound transducer: Principle, construction and working, characteristics of US beam.
- **Ultrasound display modes:** A, B, M

- **Real-time ultrasound:** Line density and frame rate, Real-time ultrasound transducers: mechanical and electronic arrays, ultrasound artifacts, ultrasound recording devices, and Distance, area & volume measurements.
- **Techniques for imaging different anatomic areas, ultrasound artifacts, biological effects and safety.**
- **Doppler Ultrasound:** Doppler Theory, Doppler-Frequency Shift, Reflector Velocity Dependence, Doppler Angle Dependence, Spectral Analysis, Continuous Wave (CW) Doppler, Pulsed Doppler, Pulse Transmission and Range Gating, Aliasing, Duplex Scanning, Color Flow Imaging, Power Doppler, Patient preparation for Doppler, Doppler artifacts, vascular sonography.

Manufacturing & Quality Norms

1. Manufacturing & Quality Norms- keep it differently according to all applications
   - Manpower Deployment and Operations as per Work Instructions and criticality of the process Understanding how to form each operation and practical training of operation
   - Understanding accept and reject criterion of a particular operation. Practical training of testing/checking each operation
   - Quality Norms of accept and practical training of electronic equipment's/Devices Acceptance/Rejection training of various defects
2. Manufacturing & Quality Norms – II
   - Process in packing line-packing line Operations sequence flow and its importance
   - Quality Systems - Accept, Reject criterion of various tests at OQA
   - Training of Assembly of electronic components - Assemble, Check, test electronic components
   - Various Labels and their Importance - Understanding Labels, Scanning and its importance
   - Packing of components/devices - Various Stages of packing
   - Acceptance, Reject and sampling following QA norms - AQL level, Sampling techniques, as per QA sampling accept, reject numbers

Electronics Devices Circuit-II

1. Good Manufacturing Concepts & Practices - II
   - Brief Introduction
   - Total Quality Management
   - ISO Standards
2. Kaizen
3. Toyota Production System
4. Lean Manufacturing
   - Combination of Inventory
   - Supply Chain
5. Quality and Inspection
   - 3 Sigma and 6 Sigma Orientation

Electronic Devices and Circuits –II Lab

1. Characteristic of BJT: BJT in CE configuration- Graphical measurement of parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
2. Measurement of Operational Amplifier Parameters: Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
3. Applications of Op-amp: Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
4. Field Effect Transistors: Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
5. Oscillators: Sinusoidal oscillators. Wein's bridge oscillator b. phase shift oscillator.

Manufacturing Practices

1. Work study concepts
2. Team work concepts

(Semester V)

MRI, Image Processing and Recording

1. Basic concepts of Magnetic resonance imaging (MRI): Atomic structure, Hydrogen as imaging medium, magnetism, precession, resonance, Electromagnetic radiation, NMR - basic concepts of MRI, Faraday's cage.
2. Basic MR Image formation: RF Excitation, Relaxation (T1 and T2), Computation and display, Free induction decay, RF wave form designs.
3. Introduction to MR coils: Volume coils, Gradient coils, Slice selection, phase encoding, frequency encoding
4. Artifacts: Cause of artifacts, Image quality, image contrast, signal to noise ratio, resolution, artefacts, MR contrast agents, Advanced MR techniques, flow effects, MR angiography echo planner imaging, magnetization transfer, fat suppression, MR spectroscopy, functional imaging, Magnetic resonance hazards and safety, Recent development.
5. MRI Scanners: Methods of MRI imaging methods; Head and Neck ,Thorax, Abdomen, Musculoskeletal System imaging; Clinical indications and contraindications; types of common sequences effects of sequence on imaging; Protocols for various studies, slice section, patient preparation; positioning of the patient; patient care-calibration - paramagnetic agents and dose, additional techniques and recent advances in MRI; image acquisition-modification of procedures in an unconscious or un co-operative patient; plain studies; contrast studies; special procedures; reconstructions; 3D images; MRS blood flow imaging, diffusion/perfusion scans; strength and limitations of MRI; role ofradiographer.
6. MR safety: instrumentation and biological effects

Advanced Imaging

1. Computed Tomography its principle, various generations and advancements.
2. Ultrasonography, Color Doppler- its principle, advancements and applications.
3. Digital Radiography and Digital subtraction angiography equipment- principle, advancements and applications.
4. Fusion Imaging including PET-CT, PET- MRI.
5. Digital Mammography, DEXA equipment- principle, advancements and applications.
6. Tele radiology HIS, RIS and PACS
7. Image processing in digital radiography systems: Post processing techniques in console using CR, DR and flat panel fluoroscopy systems
8. Basic angiography and DSA

MRI, Image Processing and Recording

1. MRI Images of the Thorax - Normal and pathologic
2. MR Images of Abdomen - Normal and pathologic
3. MR Images of the Male/Female Pelvis- Normal and pathologic
4. Neuro Anatomy- Scan planes brain - Cerebral hemispheres, Sinuses, Ventricles, Brainstem and associated parts, Arterial/venous systems, Basal ganglia, Cranial nerves
5. Spine- Vertebra and disc, Spinal cord and meninges

Advanced Imaging

1. Central Nervous System: Myelography, Cerebral studies, Ventriculography
2. Arthrography: Shoulder, Hip, Knee, Elbow
3. Angiography: Carotid Angiography (4 Vessel angiography), Thoracic and Arch Aortography, Selective studies: Renal, SMA, Coeliac axis, Vertebral angiography, Femoral arteriography, Angiocardiography
4. Venography: Peripheral venography, Cerebral venography, Inferior and superior venocavography, Relevant visceral phlebography
5. Cardiac catheterization procedures: PTCA, BMV, CAG, Pacemaker, Electrophyiology
6. Gynaecology: Hysterosalpingography
7. Biliary system: Plain film radiography, Intravenous cholangiography, percutaneous cholangiography, Endoscopic retrograde cholangio-pancreatography. (ERCP), Operative cholangiography, Post-Operative cholangiography (T-tube Cholangiography)
8. Gastrointestinal tract: Barium meal, Barium swallow, Small bowel enema, Barium enema.
9. Renal tract: Intravenous urography, retrograde pyelography, micturating cystourethrography.
10. Other: Sialography

(Semester VI)

Admin, Medico Legal and Interventional Procedures

1. Principals of Management: Introduction to management, Strategic Management, Foundations of Planning, Planning Tools and Techniques, Decision Making, conflict and stress management, Managing Change and Innovation, Understanding Groups and Teams, Leadership, Time Management, Cost and efficiency.
2. Medical law and ethics: Medical ethics; Definition, Goal, Scope; Introduction to Code of conduct; Basic principles of medical ethics – Confidentiality; Malpractice and negligence; Autonomy and informed consent - Right of patients; Care of the terminally ill-Euthanasia ; Organ transplantation; Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects; Professional Indemnity insurance policy; Development of standardized protocol to avoid near miss or sentinel events; Obtaining an informed consent.
3. Quality and patient safety: Quality assurance; Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines; AERB specifications, radiation safety (lead glass equivalence, lead lined doors), room size, type approval, registrations & licenses, selection of exposure parameter for various protocols, diagnostic reference levels.
4. Basics of emergency care and life support skills: Basic life support (BLS), sudden Cardiac Arrest (SCA), cardiopulmonary resuscitation (CPR), Automated External Defibrillator (AED).

Project

Project work may include case study related to Newer Imaging Technology.

Admin, Medico Legal and Interventional Procedures

1. Quality assurance and Radiation safety survey in diagnostic X-ray installations.
2. Community orientation and clinical visit**:** Visit will include visit to the entire chain of healthcare delivery system - sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics.
3. Governance at village level including interaction and group discussion with village panchayat and front line health workers.
4. Clinical visit to their respective professional department within the hospital.