2010 Scheme

Common Subjects

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
SCHEME OF TEACHING AND EXAMINATION

I SEMESTER B.E./B.TECH.

PHYSICS GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	10MAT11	Engineering Maths-I	Maths	Basic Sc.	4 (T)	100	25	125
2	10PHY12	Engineering Physics	Physics	Basic Sc.	4 (T)	100	25	125
3	10CIV13	Elements of Civil Engg. & Engineering Mechanics	Civil Engg.	Civil Engg.	4 (T)	100	25	125
4	10EME14	Elements of Mechanical Engg.	Mech. Engg.	Mech. Engg.	4 (T)	100	25	125
5	10ELE15	Basic Electrical Engg.	E & E	E & E	4 (T)	100	25	125
6	10WSL16	Workshop Practice	Mech., Auto, IP, IEM, Mfg. Engg.	Mech. Engg.	3 (L)	50	25	75
7	10PHYL17	Engg. Physics Lab	Physics	Basic Sc.	3 (L)	50	25	75
8	10CIP18	*Constitution of India & Professional Ethics	Any Department		2 (T)	50	25	75
9		Language (Kan.)	Humanities		2 (T)	---	---	---
				Total	30	**600	**175	775

II SEMESTER B.E./B.TECH.

CHEMISTRY GROUP

Sl. No.	Subject Code	Subject	Teaching Department	Board	Theory /Lab/ Drawing (Hrs/ Week)	Examination Marks		
						Th./Pr.	I.A.	Total
1	10MAT21	Engineering Maths-II	Maths	Basic Sc.	4 (T)	100	25	125
2	10CHE22	Engineering Chemistry	Chemistry	Basic Sc.	4 (T)	100	25	125
3	10CCP23	Computer Concepts & C Programming	Any Engineering Department	CSE	4 (T)	100	25	125
4	10CED24	Computer Aided Engineering Drawing	Mech./IP/Auto/ Mfg.Engg./ IEM	Mech. Engg.	6 (2T + 4L)	100	25	125
5	10ELN25	Basic Electronics	E & C/ E & E / TC / IT	E & C	4 (T)	100	25	125
6	10CPL26	Computer Programming Lab	Any Engineering Department	CSE	3 (L)	50	25	75
7	10CHEL27	Engg. Chemistry Lab	Chemistry	Basic Sc.	3 (3)	50	25	75
8	10CIV28	*Environmental Studies	Civil / Environmental	Civil	2 (T)	50	25	75
9		Language (Eng.)	Humanities		2 (T)	---	---	---
				Total	32	**600	**175	775

***CIP/Env.Engg. : Question Papers will be of Objective Type. Students have to pass the subject compulsorily, however marks will not be considered for awarding class / rank.**
****Excluding Environmental Studies/Constitution of India & Professional Ethics**

Language (Kan./Eng.) – Audit Course

ENGINEERING MATHEMATICS – I

Sub Code	:	10MAT11	IA Marks	:	25
Hrs/ Week	:	04	Examn Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT – 1

Differential Calculus - 1

Determination of n[th] derivative of standard functions-illustrative examples*. Leibnitz's theorem (without proof) and problems.

Rolle's Theorem – Geometrical interpretation. Lagrange's and Cauchy's mean value theorems. Taylor's and Maclaurin's series expansions of function of one variable (without proof).

6 Hours

UNIT – 2

Differential Calculus - 2

Indeterminate forms – L'Hospital's rule (without proof), Polar curves: Angle between polar curves, Pedal equation for polar curves. Derivative of arc length – concept and formulae without proof. Radius of curvature - Cartesian. parametric, polar and pedal forms.

7 Hours

UNIT – 3

Differential Calculus - 3

Partial differentiation: Partial derivatives, total derivative and chain rule, Jacobians-direct evaluation.

Taylor's expansion of a function of two variables-illustrative examples*. Maxima and Minima for function of two variables. Applications – Errors and approximations.

6 Hours

UNIT – 4

Vector Calculus

Scalar and vector point functions – Gradient, Divergence, Curl, Laplacian, Solenoidal and Irrotational vectors.

Vector Identities: div $(\phi\vec{A})$, Curl $(\phi\vec{A})$ Curl (grad ϕ) div (Curl$\vec{A}$) div $(\vec{A} x \vec{B})$ & Curl (Curl $\vec{A}$).

Orthogonal Curvilinear Coordinates – Definition, unit vectors, scale factors, orthogonality of Cylindrical and Spherical Systems. Expression for Gradient, Divergence, Curl, Laplacian in an orthogonal system and also in Cartesian, Cylindrical and Spherical System as particular cases – No problems

7 Hours

PART-B

UNIT – V

Integral Calculus

Differentiation under the integral sign – simple problems with constant limits. Reduction formulae for the integrals of $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ and evaluation of these integrals with standard limits - Problems.

Tracing of curves in Cartesian, Parametric and polar forms – illustrative examples*. Applications – Area, Perimeter, surface area and volume. Computation of these in respect of the curves – (i) Astroid: $x^{2/3}+y^{2/3}=a^{2/3}$ (ii) Cycloid: $x=a(\theta-\sin\theta), y=a(1-\cos\theta)$ and (iii) Cardioid: $r=a(1+\cos\theta)$

6 Hours

UNIT – VI

Differential Equations

Solution of first order and first degree equations: Recapitulation of the method of separation of variables with illustrative examples*. Homogeneous, Exact, Linear equations and reducible to these forms. Applications - orthogonal trajectories.

7 Hours

UNIT – VII

Linear Algebra-1

Recapitulation of Matrix theory. Elementary transformations, Reduction of the given matrix to echelon and normal forms, Rank of a matrix, consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions). Solution of a system of non-homogeneous equations by Gauss elimination and Gauss – Jordan methods.

6 Hours

UNIT – VIII:

Linear Algebra -2

Linear transformations, Eigen values and eigen vectors of a square matrix, Similarity of matrices, Reduction to diagonal form, Quadratic forms, Reduction of quadratic form into canonical form, Nature of quadratic forms

7 Hours

Note: * In the case of illustrative examples, questions are not to be set.

ENGINEERING PHYSICS

Sub Code	:	**10PHY12/10PHY22**	**IA Marks**	:	25
Hrs/ Week	:	04	**Exam Hours**	:	03
Total Hrs.	:	52	**Exam Marks**	:	100

PART – A

UNIT-1

Modern Physics

Introduction to Blackbody radiation spectrum, Photo-electric effect, Compton effect. Wave particle Dualism. de Broglie hypothesis – de Broglie wavelength, extension to electron particle. – Davisson and Germer Experiment.

Matter waves and their Characteristic properties. Phase velocity, group velocity and Particle velocity. Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Expression for deBroglie wavelength using group velocity.

7 Hours

UNIT-2

Quantum Mechanics

Heisenberg's uncertainity principle and its physical significance. Application of uncertainity principle (Non-existence of electron in the nucleus, Explanation for β-decay and kinetic energy of electron in an atom). Wave function. Properties and Physical significance of a wave function. Probability density and Normalisation of wave function. Setting up of a one dimensional, time independent Schrödinger wave equation. Eigen values and Eigen functions. Application of Schrödinger wave equation – Energy Eigen values for a free particle. Energy Eigen values of a particle in a potential well of infinite depth.

6 Hours

UNIT-3

Electrical Conductivity in Metals

Free-electron concept. Classical free-electron theory - Assumptions. Drift velocity. Mean collision time and mean free path. Relaxation time. Expression for drift velocity. Expression for electrical conductivity in metals. Effect of impurity and temperature on electrical resistivity of metals. Failures of classical free-electron theory.

Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics.Fermi-energy – Fermi factor. Density of states (No derivation). Expression for electrical resistivity / conductivity. Temperature dependence of resistivity of metals. Merits of Quantum free – electron theory.

7 Hours

UNIT-4

Dielectric & Magnetic Properties of Materials

Dielectric constant and polarisation of dielectric materials. Types of polarisation. Equation for internal field in liquids and solids (one dimensional). Classius – Mussoti equation. Ferro and Piezo – electricity (qualitative). Frequency dependence of dielectric constant. Important applications of dielectric materials. Classification of dia, para and ferro-magnetic materials. Hysterisis in ferromagnetic materials. Soft and Hard magnetic materials. Applications.

7 Hours

PART – B

UNIT - 5

Lasers

Principle and production. Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for Laser action. Principle, Construction and working of He-Ne and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography – Principle of Recording and reconstruction of 3-D images. Selected applications of holography.

6 Hours

UNIT-6

Optical Fibers & Superconductivity

Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation. Applications – block diagram discussion of point to point communication.

Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors - Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors– Superconducting magnets, Maglev vehicles and squids

7 Hours

UNIT-7

Crystal Structure

Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer. Crystal structures of NaCl, and diamond.

6 Hours

UNIT-8

Material Science

Introduction to Nanoscience and Nanotechnology. Nanomaterials: Shapes of nanomaterials, Methods of preparation of nanomaterials, Wonders of nanotechnology: Discovery of Fullerene and carbon nanotubes, Applications. Ultrasonic non-destructive testing of materials. Measurements of velocity in solids and liquids, Elastic constants.

6 Hours

Text Books

	Title		Author/s / Editor		Publishers
1	**Solid State Physics – Sixth Edition**	-	S.O. Pillai	-	New Age International
2	**Engineering Physics**	-	V. Rajendran	-	Tata Mc-Graw Hill Company Ltd., New Delhi

Reference Books

	Title		Author/s / Editor		Publishers
1	**Nanosystems-Molecular Machinery, Manufacturing and Computation**	-	K.Eric Drexler	-	John Wiely & Sons 2005 Ed.
2	**Fundamentals and Applications of Ultrasonic Waves**	-	J David N Cheeke and Cheeke N Cheeke	-	CRC Press
3	**Nano Materials**	-	Vishwanathan	-	Narosa Publications
4	**Engineering Physics**	-	G.K Shivakumar	-	Prism Books Pvt. Ltd.

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ENGINEERING CHEMISTRY

Sub Code	:	10CHE12/ 10CHE 22	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT – 1

Electrode Potential and Cells

Introduction, Differences between galvanic and electrolytic cells, Construction of galvanic cell, EMF of a cell , Origin of single electrode potential, Sign convention and cell notation, Standard electrode potential, Derivation of Nernst equation for single electrode potential.

Types of electrodes: Reference electrodes – Primary and secondary, Limitations of standard hydrogen electrode, Construction and working of calomel electrode and Ag – AgCl electrode, Measurement of single electrode potential, Numerical problems on electrode potential and EMF of a cell, Ion selective electrode: Glass electrode – Construction , Determination of pH of a solution using glass electrode, concentration cells, numerical problems.

7 Hours

UNIT - 2

Batteries and Fuel Cells

Basic concepts, Battery characteristics – primary, secondary and reserve batteries with examples , super capacitors

Classical batteries: Construction, working and applications of Zn – MnO_2, Lead acid storage and Ni – Cd batteries.

Modern batteries: Construction , working and applications of Zn – air, Ni – metal hydride and Li – MnO_2 batteries.

Fuel cells – Differences between battery and fuel cell, construction and working of $H_2 – O_2$ and $CH_3OH – O_2$ fuel cells.

6 Hours

UNIT - 3

Corrosion and its control

Electrochemical theory of corrosion, Galvanic series, Types of corrosion- Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting the rate of corrosion

Corrosion control: Inorganic coatings – Anodizing and phosphating, Metal coatings – Galvanizing and Tinning, Corrosion inhibitors, cathodic protection.

7 Hours

UNIT - 4

Metal Finishing

Technological importance, Significance of Polarization, Decomposition potential and Overvoltage in electroplating, Theory of electroplating. Effect of plating variables on the nature of electrodeposit- Electroplating process, Electroplating of gold and Chromium.

Distinction between electroplating and electrolessplating, Electolessplating of copper and nickel.

6 Hours

PART – B

UNIT – 5

Chemical fuels and Photovoltaic cells

Introduction, Classification of chemical fuels Calorific value – High and Low calorific values, Determination of calorific value –solid or liquid fuel using Bomb calorimeter - numerical problems .

Petroleum – Cracking by fluidized catalytic cracking process, Reformation of petrol, Octane and Cetane numbers. Knocking – mechanism and harmful effects. Antiknocking agents – TEL, Catalytic converters – Principle and working, Unleaded petrol, Power alcohol and Biodiesel.

Photovoltaic cells – Production of solar grade silicon, Doping of silicon, Construction and working of photovoltaic cell, Advantages.

7 Hours

UNIT – 6

The Phase rule and Instrumental methods of analysis

Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water system, Condensed phase rule , Phase diagram of two component system- Eutectic Pb – Ag system and Fe – C system. Application – Desilverization of lead.

Instrumental methods of analysis- Theory , Instrumentation and applications of Colorimetry, Potentiometry , Conductometry and Flame photometry.

6 Hours

UNIT - 7

Polymers

Types of polymerization – Addition and Condensation, Mechanism of polymerization – Free radical mechanism taking ethylene as example. Glass transition temperature (T_g) , Structure – property relationship. Types of plastics – Thermosetting and thermoplastics. Manufacture of plastics by compression ,injection and extrusion moulding.

Synthesis and applications of Teflon, PMMA, Polyurethane and Phenol – formaldehyde resins.

Elastomers: Deficiencies of natural rubber, Vulcanization of rubber. Synthesis and applications of Neoprene and Butyl rubber, Silicone rubbers.
Adhesives: Synthesis and applications of epoxy resins.
Polymer composites - Synthesis and applications of Kevlar and Carbon fibers.
Conducting polymers – Definition, Mechanism of conduction in Polyacetylene, applications.

7 Hours

UNIT - 8

Water Chemistry

Impurities in water ,Water analysis – Determination of different constituents in water – Hardness, alkalinity, chloride , fluoride , nitrate , sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Sewage – BOD and COD, Numerical problems, Sewage treatment. Desalination of water – Reverse Osmosis and Electrodialysis

6 Hours

Text Books:

1. Chemistry for Engineering students by B.S. Jai Prakash, R.Venugopal, Sivakumaraiah and Pushpa Iyengar
2. Engineering Chemistry by O.G. Palanna, Tata McGraw Hill Publishing Pvt.Ltd. New Delhi 2009

Reference Books:

1. Principles of Physical Chemistry B.R. Puri , L.R.Sharma & M.S. Pathania, S. Nagin chand and Co.
2. A text book of Engineering Chemistry P.C. Jain and Monica Jain Dhanpatrai Publications , New Delhi.

1 Corrosion Engineering M.G. Fontana Mc. Graw Hill Publications.
2 Chemistry in Engineering and Technology (Vol. 1 &2) J.C. Kuriacose and J. Rajaram.
3 Polymer Science V.R. Gowariker , Wiley Eastern Ltd.

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ELEMENTS OF CIVIL ENGINEERING & ENGINEERING MECHANICS

Sub Code	:	10CIV13/10CIV23	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT-1

1. Introduction to Civil Engineering, Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

   Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities on socio-economic development of a country.

   4 Hours

2. Roads: Type of roads, Components and their functions.

   2 Hours

3. Bridges and Dams: Different types with simple sketches.

   1 Hour

UNIT -2

4. Introduction to Engineering mechanics: Basic idealisations - Particle, Continuum and Rigid body; Force and its characteristics, types of forces, Classification of force systems; Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces; Newton's laws of motion, Introduction to SI units, Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, on equivalent force - couple system.

   7 Hours

UNIT -3

5. Composition of forces - Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.

   3 Hours

6. Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.

5 Hours

UNIT -4

7. Centroid of plane figures; Locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle using method of integration, Centroid of simple built up sections; Numerical problems.

6 Hours

PART - B

UNIT -5

8. Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non concurrent force systems. **6 Hours**

UNIT -6

9. Types of supports, statically determinate beams, Numerical problems on support reactions for statically determinate beams and analysis of simple trusses (Method of joints and method of sections).

6 Hours

UNIT -7

10. Friction - Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Wedge friction; Ladder friction; Numerical problems.

6 Hours

UNIT -8

11. Moment of inertia of an area, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, circular and triangular areas from method of integration; Moment of inertia of composite areas; Numerical problems.

6 Hours

Text Books:

1. Engineering Mechanics by S.Timoshenko,D.H.Young, and J.V.Rao TATA McGraw-Hill Book Company, New Delhi
2. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3^{rd} edition 2009.
3. Elements of Civil Engineering and Engineering Mechanics by M.N.Sheshaprakash amd G.B.Mogaveer PHI Learning (2009)

COMPUTER CONCEPTS AND C PROGRAMMING

Subject Code	**: 10CCP13/10CCP23**	**IA Marks**	**: 25**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs.	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT-1

Introduction to Computer Systems, Interacting with the Computer, Computer Organization

The Computer defined, Early history, Basic parts and structure of a computer, Categorizing Computers, Information Processing life cycle, Essential computer hardware, Essential computer software.

Keyboard, Mouse, Inputting data in other ways: Pen-based systems, Data scanning devices, Game controllers, Voice recognition devices, Microphone, Visual input devices, Video and sound, Monitors, Printers, Plotters, Data projectors, Sound systems. Number systems, ASCII, BCD, CPU, Buses, Mother Board, Chip sets, Microprocessors.

7 Hours

UNIT-2

Storage Device Concepts, Operating Systems, Networking

Storage media, Floppy drive, Hard disks, Optical media, CD-ROM, CD-R, CD-RW, DVD-ROM, Recordable DVD.

Software, Custom-made Software, Shrunk-wrapped software, Types of operating systems, Computer processing techniques, Functions of Operating Systems, Management of processor, Memory, Virtual storage, devices, and information.

Networking, Convergence of computing with communications, Networking basics, Need for networking, Basic components of a network.

7 Hours

UNIT-3

Fundamentals of Problem Solving, Introduction to C Language

Creating and running programs, System development, Software Engineering.

Introduction to C Language: Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Programming example, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-4

Structure of a C Program

Expressions, Precedence and associativity, Side effects, Evaluating expressions, Type conversion, Statements, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

PART - B

UNIT-5

Functions

Designing structured programs, Functions in C, User-defined Functions, Inter-function communication, Standard functions, Scope, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-6

Selection – Making Decisions, Repetition

Logical data and operators, Two-way selection, Multiway-selection, Concept of a loop, pre-test and post-test loops, Initialization and updating, Event controlled and count controlled loops, Loops in C, Other statements related to looping, looping applications, Recursion, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-7

Arrays, Strings

Concepts, Using arrays in C, Inter-function communication, Array applications, Bubble Sort, Binary search, Two-dimensional Arrays, Multi-dimensional arrays, String concepts, C strings, String input/output, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-8

Basic Concepts of Parallel Programming

Motivating parallelism, Scope for parallel computing, Thread basics, Why threads? OpenMP: A standard for directive – based parallel programming, The OpenMP programming model, Specifying concurrent tasks in OpenMP, Synchronization constructs in OpenMP, Data handling in OpenMP, OpenMP library functions, Environment variables in OpenMP.

6 Hours

ELEMENTS OF MECHANICAL ENGINEERING

Sub Code	:	**10EME14 / 10EME24**	**IA Marks**	:	**25**
Hrs/ Week	:	04	**Exam Hours**	:	**03**
Total Hrs.	:	52	**Exam Marks**	:	**100**

PART – A

UNIT-1

Energy and Steam

Forms, Sources and Classification of energy. Utilization of energy with simple block diagrams. Steam formation. Types of steam. Steam properties – Specific Volume, Enthalpy and Internal energy. (simple numerical problems) Steam boilers – classification, Lancashire boiler, Babcock and Wilcox boiler, Boiler mountings, Accessories, their locations and applications. (No sketches for mountings and accessories)

7 Hours

UNIT-2

Turbines

Steam turbines – Classification, Principle of operation of Impulse and reaction. Delaval's turbine, Parson's turbine. Compounding of Impulse turbines.

Gas turbines – Classification, Working principles and Operations of Open cycle and Closed cycle gas turbines.

Water turbines –Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine

7 Hours

UNIT-3

Internal Combustion Engines

Classification, I.C. Engines parts, 2/4 – Stroke Petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, Brake power, Indicated thermal efficiency, Brake thermal efficiency, Mechanical efficiency and specific fuel consumption.

6 Hours

UNIT-4

Refrigeration and Air conditioning

Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, Unit of Refrigeration. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Principles and applications of air conditioners, Room air conditioner.

6 Hours

PART – B

UNIT-5

Lathe and Drilling Machines

Lathe - Principle of working of a centre lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.

Drilling Machine – Principle of working and classification of drilling machines. bench drilling Machine, Radial drilling machine. Operations on drilling machine -Drilling, Boring, Reaming, Tapping, Counter sinking, Counter boring and Spot facing. Specification of radial drilling machine.

7 Hours

UNIT-6

Milling and Grinding Machines

Milling Machine – Principle of milling, Types of milling machines. Principle & working of horizontal and vertical milling machines. Milling Processes - Plane milling, End milling, Slot milling, Angular milling, Form milling, Straddle milling and Gang milling. Specification of universal milling machine.

Grinding Machine – Principle and classification of Grinding Machines. Abrasives- Definition, Types and applications. Bonding materials. Type of Grinding machines, Principle and working of surface grinding, Cylindrical grinding and Centerless grinding.

7 Hours

UNIT-7

Joining Processes, Lubrication and Bearings

Soldering, Brazing and Welding

Definitions. Classification and method of Soldering, Brazing and welding and differences. Brief description of arc welding and Oxy-Acetylene welding

Lubrication and Bearings

Lubricants-Classification and properties. Screwcap, Tell-Tale, Drop feed, Wick feed and Needle lubricators. Ring, Splash and Full pressure lubrication. Classification of bearings, Bushed bearing, Pedestal bearing, Pivot bearing, Collar bearings and Antifriction bearings.

6 Hours

UNIT-8

Power Transmission

Belt Drives - Classification and applications, Derivations on length of belt. Definitions - Velocity ratio, Creep and slip, Idler pulley, stepped pulley and fast & loose pulley.

Gears - Definitions, Terminology, Types and uses. Gear drives and **Gear Trains** – Definitions and classifications, Simple problems.

6 Hours

Text Books:

1. A Text Book of Elements of Mechanical Engineering - S. Trymbaka Murthy, 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.

Reference Books:

1. A Text Book of Elements of Mechanical Engineering – K.R. Gopalkrishna, Subhash Publishers, Bangalore.
2. The Elements of Workshop Technology - Vol I & II , SKH Chowdhary, AKH Chowdhary , Nirjhar Roy, 11th edition 2001, Media Promotors and Publishers, Mumbai.
3. Elements of Mechanical Engineering –Dr.A.S.Ravindra, Best Publications, 7th edition 2009.

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COMPUTER AIDED ENGINEERING DRAWING

Sub Code	:	10CED14 / 10CED24	IA Marks	:	25
Hrs/ Week	:	06 (Instruction 2 hr. + Sketching & Practice 4 hr.)	Exam Hours	:	03
Total Hrs.	:	84 (Instruction 28 hr. +Sketching & Practice 56 hr.)	Exam Marks	:	100

1. Introduction to Computer Aided Sketching

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

Computer screen, 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 viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.

12 Hours

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 (No application problems).

12 Hours

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 (No problems on punched plates and composite plates).

12 Hours

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 (No problems on octahedrons and combination solid).

24 Hours

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. (No problems on sections of solids)
Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).

12 Hours

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 and combination of solids (Maximum of three solids).

12 Hours

Text Books:

1. **Engineering Drawing** - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. **A Primer on Computer Aided Engineering Drawing-2006**, Published by VTU, Belgaum.

Reference Books:

1. **Computer Aided Engineering Drawing** - S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.
2. **Engineering Graphics** - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
3. **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.
4. **Computer Aided Engineering drawing-** Prof. M. H. Annaiah, New Age International Publisher, New Delhi. 2009.

Conducting classes
Classes may be conducted in two slots/ week of 3 hours each (Instruction 1 hr. +Sketching & Practice 2 hr.)

Scheme of Evaluation for Internal Assessment (25 Marks)

1. 15 Marks for Class work (Sketching & Computer Aided Engineering drawing printouts in A4 size sheets).
2. 10 Marks for test in the same pattern as that of the main examination.(Better of the two Tests).

All the solutions must be valued on the spot by examining the sketches, display and the hard copies. All the sketches including the computer printouts must be submitted and they must be preserved for one year.

Scheme of Examination

1. Chapter 1 is only for practice and Internal Assessment and not for examination.
2. Separate Question paper must be set for each batch of students, jointly by the Internal & External examiners.
3. A maximum of **THREE** questions must be set as per the following pattern *(No mixing of questions from different Chapters).*

Q. No.	From Chapters	Marks Allotted
1	Chapter 2 or Chapter 3	30
2	Chapter 4	40
3	Chapter 5 or Chapter 6	30
Total		**100**

Scheme of Evaluation

Q. No.	Solutions & Sketching on graph book	Computer display & printout	Total Marks
1	10 Marks	20 Marks	30
2	15 Marks	25 Marks	40
3	15 Marks	15 Marks	30
Total	**40 Marks**	**60 Marks**	**100**

Students have to submit the computer printouts and the sketches drawn on the graph sheets at the end of the examination. Both Internal & External examiners have to jointly evaluate the solutions (sketches) and computer display & printouts of each student for 100 marks (40 marks for solutions & sketches + 60 marks for computer display and printouts) and submit the marks list along with the solution (sketches) on graph sheets & computer printouts in separate covers.

4. Each batch must consist of a minimum of 10 students and a maximum of 12 students.

5. Examination can be conducted in parallel batches, if necessary.

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BASIC ELECTRICAL ENGINEERING

Sub Code	:	10ELE15/ 10ELE25	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1

1–a) D. C. Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy. Illustrative examples.

4Hours

1–b) Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Illustrative examples.

3Hours

UNIT-2

2.Single-phase A.C. Circuits: Generation of sinusoidal voltage, definition of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, R-L, R-C and R-L-C circuits, real power, reactive power, apparent power and power factor. Illustrative examples involving series, parallel and series- parallel circuits.

7 Hours

UNIT-3

3 Three Phase Circuits: Necessity and advantages of three phase systems, generation of three phase power, definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three-phase circuits, measurement of power by two-wattmeter method. Illustrative examples.

6 Hours

UNIT-4

4–a) Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter (problems excluded).

3 Hours

4–b) Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on Cleat, Casing & Capping and conduit (concealed) wiring. Two-way and three-way control of a lamp. Elementary discussion on fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock –Earthing: Pipe and Plate.

3 Hours

PART – B

UNIT-5

5.DC Machines: Working principle of DC machine as a generator and a motor. Types and constructional features. emf equation of generator, relation between emf induced and terminal voltage enumerating the brush drop and drop due to armature reaction. Illustrative examples.

DC motor working principle. Back emf and its significance, torque equation. Types of D.C. motors, characteristics and applications. Necessity of a starter for DC motor. Illustrative examples on back emf and torque.

7 Hours

UNIT-6

6. Transformers: Principle of operation and construction of single-phase transformers (core and shell types). emf equation, losses, efficiency and voltage regulation (Open Circuit and Short circuit tests, equivalent circuit and phasor diagrams are excluded). Illustrative problems on emf equation and efficiency only.

7 Hours

UNIT-7

7. Synchronous Generators: Principle of operation. Types and constructional features. emf equation. Concept of winding factor (excluding derivation of distribution and pitch factors). Illustrative examples on emf. equation.

6 Hours

UNIT-8

8. Three Phase Induction Motors: Concept of rotating magnetic field. Principle of operation. Types and Constructional features. Slip and its significance. Applications of squirrel - cage and slip - ring motors. Necessity of a starter, star-delta starter. Illustrative examples on slip calculations.

6 Hours

Text Books:

1. "Basic Electrical Engineering", D C Kulshreshtha, ,TMH,2009 Edition.
2. "Fundamentals of Electrical Engineering", Rajendra Prasad, PHI, Second Edition, 2009.

BASIC ELECTRONICS

Sub Code	:	10ELN15 / 10ELN25	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT-1

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Temperature dependence of p-n characteristics, AC equivalent circuits, Zener diodes Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Shunt capacitor filter - Approximate analysis of capacitor filters, Power supply performance, Zener diode voltage regulators, Numerical examples as applicable.

7 Hours

UNIT-2

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.

6 Hours

UNIT-3

BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, Bias circuit design, Thermal Stability of Bias Circuits (Qualitative discussions only).

6 Hours

UNIT-4

OTHER DEVICES: Silicon Controlled Rectifier (S.C.R), SCR Control Circuits, More S.C.R applications; Unijunction transistor, UJT applications, Junction Field effect Transistors(Exclude Fabrication and Packaging), JFET Characteristics, FET Amplifications, Numerical examples as applicable.

7 Hours

PART - B

UNIT-5

AMPLIFIERS & OSCILLATORS: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley ,Colpitts and crystal oscillator (Qualitative discussions only) Numerical problems as applicable.

6 Hours

UNIT-6

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP, Saturable property of an OP AMP, Inverting and Non Inverting OPAMP circuits, Need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable Cathode Ray Oscilloscope (CRO).

6 Hours

UNIT-7

COMMUNICATION SYSTEMS: Block diagram, Modulation, Radio Systems, Superhetrodyne Receivers, Numerical examples as applicable

NUMBER SYSTEMS: Introduction, decimal system, Binary, Octal and Hexadecimal number systems, addition and subtraction, fractional number, Binary Coded Decimal numbers.

7 Hours

UNIT-8

DIGITAL LOGIC:, Boolean algebra, Logic gates, Half-adder, Full-adder, Parallel Binary adder.

7 Hours

Text Books:

1. Electronic Devices and Circuits: David. A. Bell; Oxford University Press, 5th Edn., 2008.

Reference Books:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias TMH, 1991 Reprint 2001.
2. Electronic Communication Systems, George Kennedy, TMH 4th Edition.
3. Digital Logic and Computer Design, Morris Mano, PHI, EEE.
4. Basic Eelctronics, RD Sudhaker Samuel, U B Mahadevaswamy, V. Nattarsu, Saguine-Pearson, 2007.

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WORKSHOP PRACTICE

Sub Code	:	**10WSL16/ 10WSL26**	**IA Marks**	:	**25**
Hrs/ Week	:	**03**	**Exam Hours**	:	**03**
Total Hrs.	:	**42**	**Exam Marks**	:	**50**

1. Fitting

   i. Study of fitting tools
   ii. Study of fitting operations & joints
   iii. Minimum 5 models involving rectangular, triangular, semi circular and dovetail joints.

2. Welding

   iv. Study of electric arc welding tools & equipments
   v. Minimum 4 Models- electric arc welding-Butt joint, Lap joint, T-joint & L-joint.

3. Study and demonstration of Sheet metal and soldering work.
4. Study & demonstration of power Tools in Mechanical Engineering

Scheme of Examination:

Fitting	30 Marks
Welding	10 Marks
Viva Voce	10 marks

Reference Book:

1. The Elements of Workshop Technology -, Vol 1 & 2, S.K.H. Choudhury, A.K.H.Choudhury, Nirjhar Roy, 11th edition, 2001, Media Promoters and Publishers, Mumbai.

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COMPUTER PROGRAMMING LABORATORY

Subject Code	: 10CPL16 / 10CPL26	IA Marks	: 25
Hrs/Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

PART – A

1. Design, develop and execute a program in C to find and output all the roots of a given quadratic equation, for non-zero coefficients.
2. Design, develop and execute a program in C to implement Euclid's algorithm to find the GCD and LCM of two integers and to output the results along with the given integers.
3. Design, develop and execute a program in C to reverse a given four digit integer number and check whether it is a palindrome or not. Output the given number with suitable message.
4. Design, develop and execute a program in C to evaluate the given polynomial $f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$ for given value of x and the coefficients using Horner's method.
5. Design, develop and execute a program in C to copy its input to its output, replacing each string of one or more blanks by a single blank.
6. Design, develop and execute a program in C to input N integer numbers in ascending order into a single dimensional array and perform a binary search for a given key integer number and report success or failure in the form of a suitable message.
7. Design, develop and execute a program in C to input N integer numbers into a single dimensional array, sort them in ascending order using bubble sort technique and print both the given array and the sorted array with suitable headings.
8. Design, develop and execute a program in C to compute and print the word length on the host machine.

PART – B

9. Design, develop and execute a program in C to calculate the approximate value of exp(0.5) using the Taylor Series expansion for the exponential function. Use the terms in the expansion until the last term is less than the machine epsilon defined FLT_EPSILON in the header file <float.h>. Also print the value returned by the Mathematical function exp( ).
10. Design, develop and execute a program in C to read two matrices A (M x N) and B (P x Q) and compute the product of A and B if the matrices are compatible for multiplication. The program must print the input matrices and

the resultant matrix with suitable headings and format if the matrices are compatible for multiplication, otherwise the program must print a suitable message. (For the purpose of demonstration, the array sizes M, N, P, and Q can all be less than or equal to 3)

11. Design, develop and execute a parallel program in C to add, element-wise, two one-dimensional arrays A and B of N integer elements and store the result in another one-dimensional array C of N integer elements.

12. Design and develop a function rightrot (x, n) in C that returns the value of the integer x rotated to the right by n bit positions as an unsigned integer. Invoke the function from the main with different values for x and n and print the results with suitable headings.

13. Design and develop a function isprime (x) that accepts an integer argument and returns 1 if the argument is prime and 0 otherwise. The function must use plain division checking approach to determine if a given number is prime. Invoke this function from the main with different values obtained from the user and print appropriate messages.

14. Design, develop and execute a parallel program in C to determine and print the prime numbers which are less than 100 making use of algorithm of the Sieve of Eratosthenes.

15. Design and develop a function reverses (s) in C to reverse the string s in place. Invoke this function from the main for different strings and print the original and reversed strings.

16. Design and develop a function match any (s1,s2) which returns the first location in the string s1 where any character from the string s2 occurs, or – 1 if s1 contains no character from s2. Do not use the standard library function which does a similar job! Invoke the function match any (s1. s2) from the main for different strings and print both the strings and the return value from the function match any (s1,s2).

Note: In the practical examination, the student has to answer two questions. One question from Part A and one question from Part B will be selected by the student by lots. All the questions listed in the syllabus have to be included in the lots. The change of question (Part A only / Part B only / Both Part A & Part B) has to be considered, provided the request is made for the same, within half an hour from the start of the examination. The allotment of marks is as detailed below:

Sl. No.	Activity		Max. Marks
1.	Procedure Writing program & procedure for the assigned problems along with algorithms / flowchart	Part A	5*
		Part B	5*
2.	Conduction Execution of the program and	Part A	10

	showing the results in proper format	Part B	20
3.	Viva-voce**		10
Total Max. Marks			50
Minimum passing Marks (40% of Max. Marks)			20

* To be considered as zero if student has been allowed change of question.

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LABORATORY EXPERIMENTS IN ENGINEERING PHYSICS

Sub Code	:	10PHYL17/10PHYL27	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03
Total Hrs.	:	10 (To be completed)	Exam Marks	:	50

EXPERIMENTS :

1. Series & Parallel LCR Circuits.(Determination of resonant frequency & quality factor)
2. I-V Characteristics of Zener Diode.(determination of knee voltage, zener voltage & forward resistance)
3. Characteristics of a Transistor.(Study of Input & Output characteristics and calculation of input resistance, output resistance & amplification factor)
4. Photo Diode Characteristics.(Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage & intensity)
5. Ultrasonic Interferometer (Measurement of velocity of sounds in solids/liquids).
6. Dielectric constant (Measurement of dielectric constant).
7. Magnetic properties (Study of retentivity and coercivity by B-H graph method).
8. Diffraction (Measurement of wavelength of laser / Hg source using diffraction grating).
9. Planck's constant (Using the principle of photoelectric effect/LED's).
10. Electrical Resistivity (Determination of resistivity in semiconductor by Four probe method).
11. Verification of Stefan's law.
12. Determination of Fermi energy.(Measurement of Fermi energy in copper)
13. Uniform Bending Experiment.(Determination of Youngs modulus of material bar)
14. Newtons Rings.(Determination of radius of curvature of planoconvex lens)

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ENGINEERING CHEMISTRY LABORATORY

Sub Code	:	10CHEL17/10CHEL27	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03
Total Hrs.	:	42	Exam Marks	:	50

PART – A

1. Potentiometric estimation of FAS using standard K2Cr2O7 solution
2. Colorimetric estimation of Copper
3. Conductometric estimation of an Acid mixture using standard NaOH solution
4. Flame Photometric estimation of Sodium and Potassium in the given sample of Water
5. Determination of pKa of a weak acid using pH Meter
6. Determination of Viscosity co-efficient of a given liquid using Ostwald's Viscometer.

PART – B

1. Determination of Total Hardness of a sample of Water using Disodium salt of EDTA.
2. Determination of CaO in the given sample of Cement by Rapid EDTA method.
3. Determination of Percentage of Copper in Brass using standard Sodium thiosulphate solution.
4. Determination of Iron in the given sample of Haematite ore solution using Potassium dichromate Crystals by external indicator method.
5. Determination of COD of the given Industrial Waste water sample.
6. Determination of Total Alkalinity of a given Water Sample using standard Hydrochloric acid.

References Books:

1) Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
2) Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J. Bassett, J. Mendham and R.C Denney.

Scheme of Examination:

One experiment from Part- A and another from Part - B shall be set. Different experiments may be set from Part- A and a common experiment from Part – B.

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CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Sub Code	:	10CIP18/10CIP28	IA Marks	:	25
Hrs/ Week	:	02	Exam Hours	:	02
Total Hrs.	:	26	Exam Marks	:	50

1 Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases. **4 Hours**

2 Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance. **3 Hours**

3 Union Executive – President, Prime Minister, Parliament & the Supreme Court of India. **3 Hours**

4 State executive – Governors, Chief Minister, State Legislator and High Courts. **3 Hours**

5 Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions. **4 Hours**

6 Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments. **3 Hours**

7 Scope & aims of engineering Ethics. Responsibility of Engineers. Impediments to responsibility. **3 Hours**

8 Honesty, Integrity and reliability, risks, safety & liability in engineering. **3 Hours**

Text Books:

1. Durga Das Basu: "Introduction to the Constitution of India" (Students Edn.) Prentice – Hall EEE, $19^{th}/20^{th}$ Edn., 2001.
2. "Engineering Ethics" by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins Thompson Asia, 2003-08-05.

Reference Books:

1. "An Introduction to Constitution of India" by M.V.Pylee, Vikas Publishing, 2002.
2. "Engineering Ethics" by M. Govindarajan, S.Natarajan, V.S. Senthilkumar., Prentice – Hall of India Pvt. Ltd. New Delhi, 2004.

Scheme of examination:

Question paper is of objective type. Students have to pass this subject compulsorily. However, marks will not be considered for awarding class/rank.

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ENVIRONMENTAL STUDIES

Sub Code	:	10CIV18/10CIV28	IA Marks	:	25
Hrs/ Week	:	02	Exam Hours	:	02
Total Hrs.	:	26	Exam Marks	:	50

PART – A

UNIT-1

Environment -_ Definition, Eco system -- Balanced ecosystem, Human activities - Food, Shelter, Economic and Social Security

3 Hours

UNIT-2

Effects of human activities on environment - Agriculture, Housing, Industry, Mining, and Transportation activities, Environmental Impact Assessment. Sustainable Development.

3 Hours

UNIT-3

Natural Resources - Water resources - Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material Cycles - Carbon, Nitrogen and Sulphur Cycles.

4 Hours

UNIT-4

Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non - Conventional sources - Hydro Electric, Fossil fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy.

4 Hours

PART – B

UNIT-5

Environmental Pollution and their effects. Water pollution. Land pollution . Noise pollution . Public Health aspects.

3 Hours

UNIT-6

Current Environmental issues of importance:
Population Growth, Climate change and Global warming - Effects, Urbanization, Automobile pollution

3 Hours

UNIT-7
Acid Rain, Ozone layer depletion, Animal Husbandry

3 Hours

UNIT-8
Environmental Protection - Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education.

3 Hours

Question paper is of objective type for 50 marks **(Fifty questions have to be set with 4 multiple choice answers).** Students have to pass the subject compulsorily. However, marks will not be considered for awarding class/ rank.

Text Books:

1) Benny Joseph (2005), "Environmental Studies", Tata McGraw - Hill Publishing Company Limited
2) Ranjit Daniels R.J. and Jagdish Kirshnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi
3) Rajagopalan R. (2005), "Environmental Studies – From Crisis to Cure", Oxford Univesity Press

Reference Books:

1) Raman Sivakumar, (2005), "Principles of Environmental Science and Engineering", Second Edition, Cengage learning, Singapore
2) Meenakshi P. (2006), "Elements of Environmental Science and Engineering"; Prentice Hall of India Private Limited, New Delhi
3) Prakash S.M. (2007), "Environmental Studies", Elite Publishers, Mangalore
4) Erach Bharucha (2005), "Text Book of Environmental Studies", for UGC, University Press
5) Tyler Miller Jr. G. (2004), "Environmental Science – Working with the Earth", Tenth Edition, Thomson Brooks/Cole
6) Tyler Miller Jr. G. (2006), "Environmental Science – Working with the Earth", Eleventh Edition, Thomson Brooks/Cole
7) "Text Book of Environmental and Ecology" by Dr. Pratibha Sing, Dr. Anoop Singh and Dr. Piyush Malaviya. Acme Learning Pvt. Ltd., New Delhi.

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ENGINEERING MATHEMATICS – II

Sub Code	:	**10MAT21**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	Exam Hours	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART-A

UNIT-1

Differential Equations - 1

Equations of first order and higher degree (p-y-x equations), Equations solvable for p-y-x. General and singular solutions, Clairauit's equation. Applications of differential equations of first order–illustrative examples*.

6 Hours

UNIT-2

Differential Equations – 2

Linear differential equations: Solution of second and higher order equations with constant coefficients by inverse differential operator method. Simultaneous differential equations of first order – Applications.

7 Hours

UNIT-3

Differential Equations – 3

Method of variation of parameters, Solutions of Cauchy's and Legendre's linear equations, Series solution of equations of second order, Frobenius method – simple problems.

6 Hours

UNIT-4

Partial Differential Equations (PDE)

Formation of Partial differential equations (PDE) by elimination of arbitrary constants/ functions. Solution of non-homogeneous PDE by direct integration. Solution homogeneous PDE involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Solution of PDE by the Method of separation of variables (first and second order equations)

7 Hours

PART-B

UNIT-5

Integral Calculus

Multiple Integrals – Evaluation of Double integrals and triple integrals. Evaluation of double integrals over a given region, by change of order of integration, by change of variables. Applications to area and volume – illustrative examples*.

Beta and Gamma Functions - Properties and problems

6 Hours

UNIT-6

Vector Integration

Line integrals – definition and problems, Surface and volume integrals-definition. Green's theorem in a plane, Stoke's and Gauss divergence theorem (statements only).

6 Hours

UNIT-7

Laplace Transforms-1

Definition, transforms of elementary functions, properties, Periodic function, Unit step function and unit impulse function.

7 Hours

UNIT-8

Laplace Transorms-2

Inverse Laplace Transforms, Convolution theorem, solution of linear differential equations using Laplace transforms. Applications – illustrative examples*.

7 Hours

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1) B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2) Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1) B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2) Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd. Publishers.

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Civil Engineering

SCHEME OF TEACHING & EXAMINATION
BE CIVIL ENGINEERING
III SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching hours /week		Examination			
				Th.	Pr.	Dur-ation	I.A. Max. Marks	Theory/ Pract. Max. Marks	Total Marks Max. Marks
1	10 MAT 31	Engineering Mathematics –III	Maths	4	--	3	25	100	125
2	10 CV 32	Building Materials and Construction Technology	Civil	4	--	3	25	100	125
3	10 CV 33	Strength of Materials	Civil	4	--	3	25	100	125
4	10 CV 34	Surveying – I	Civil	4	--	3	25	100	125
5	10 CV 35	Fluid Mechanics	Civil	4	--	3	25	100	125
6	10 CV 36	Applied Engineering Geology	Civil/Geo.	4	--	3	25	100	125
7	10 CVL 37	Civil Engg. Material Testing Laboratory	Civil	---	3	3	25	50	75
8	10 CVL 38	Surveying Practice – I	Civil	---	3	3	25	50	75
			Total	**22**	**08**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING & EXAMINATION
BE CIVIL ENGINEERING
IV SEMESTER

S. No	Subject Code	Title	Teaching Dept.	Teaching hours /week		Examination			
				Th.	Pr.	Dur-ation	I.A. Max. Marks	Theory/ Pract. Max. Marks	Total Marks Max. Marks
1	10 MAT 41	Engineering Mathematics –IV	Maths	4	--	3	25	100	125
2	10 CV 42	Concrete Technology	Civil	4	--	3	25	100	125
3	10 CV 43	Structural Analysis – I	Civil	4	--	3	25	100	125
4	10 CV 44	Surveying – II	Civil	4	--	3	25	100	125
5	10 CV 45	Hydraulics and Hydraulic Machines	Civil	4	--	3	25	100	125
6	10 CV 46	Building Planning & Drawing	Civil	1	6	4	25	100	125
7	10 CVL 47	Surveying Practice-II Laboratory	Civil	---	3	3	25	50	75
8	10 CVL 48	Applied Engineering Geology Laboratory	Civil/Geo.	---	3	3	25	50	75
			Total	**21**	**12**	**25**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION
B.E. CIVIL EINGINEERING
V SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10 AL 51	Management & Entrepreneurship	Any Dept.	04	-	03	25	100	125
2	10 CV 52	Design of RCC Structural Elements	Civil	04	--	03	25	100	125
3	10 CV 53	Structural Analysis – II	Civil	04	--	03	25	100	125
4	10 CV 54	Geotechnical Engineering. – I	Civil	04	--	03	25	100	125
5	10 CV 55	Hydrology and Irrigation Engineering	Civil	04	--	03	25	100	125
6	10 CV 56	Transportation Engineering – I	Civil	04	--	03	25	100	125
7	10 CVL 57	Hydraulics and Hydraulic Machinery Lab.	Civil	--	03	03	25	50	75
8	10 CVL 58	Computer Aided Design Lab.	Civil	--	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION
B.E. CIVIL EINGINEERING
VI SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10 CV 61	Environmental Engineering - I	Civil	04	--	03	25	100	125
2	10 CV 62	Design & Drawing of RC structures	Civil	02	03	04	25	100	125
3	10 CV 63	Transportation Engineering – II	Civil	04	--	03	25	100	125
4	10 CV 64	Geotechnical Engineering. – II	Civil	04	--	03	25	100	125
5	10 CV 65	Hydraulic Structures and Irrigation Design-Drawing	Civil	02	03	04	25	100	125
6	10 CV 66x	Elective-I (Group A)	Civil	04	--	03	25	100	125
7	10 CVL 67	Geotechnical Engineering. Lab.	Civil	--	03	03	25	50	75
8	10 CVL 68	Extensive Survey Viva Voce	Civil	--	03	03	25	50	75
TOTAL				**20**	**12**	**25**	**200**	**700**	**900**

Elective-I (Group A)

10 CV 661 Theory of Elasticity
10 CV 662 Alternative Building Materials and Technologies
10 CV 663 Ground Improvement Techniques
10 CV 664 Advanced Surveying
10 CV 665 Ground Water Hydrology
10 CV 666 Rural Water Supply and Sanitation
10 CV 667 Traffic Engineering

SCHEME OF TEACHING AND EXAMINATION
B.E. CIVIL EINGINEERING
VII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10 CV 71	Environmental Engineering.-II	Civil	04	--	03	25	100	125
2	10 CV 72	Design of Steel Structures	Civil	04	--	03	25	100	125
3	10 CV 73	Estimation and Valuation	Civil	04	--	03	25	100	125
4	10 CV 74	Design of Pre Stressed Concrete Structures	Civil	04	--	03	25	100	125
5	10 CV 75x	Elective-II (Group B)	Civil	04	--	03	25	100	125
6	10 CV 76x	Elective-III (Group C)	Civil	04	--	03	25	100	125
7	10 CVL 77	Environmental Engineering. Lab	Civil	--	03	03	25	50	75
8	10 CVL 78	Concrete and Highway Materials lab.	Civil	--	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Elective-II (Group B)

10 CV 751 Matrix Method of Structural Analysis
10 CV 752 Advanced Design of RC Structures
10 CV 753 Design of Masonry Structures
10 CV 754 Earth and Earth Retaining Structures
10 CV 755 Highway Geometric Design
10 CV 756 Open Channel Hydraulics
10 CV 757 Solid Waste Management

Elective-III (Group C)

10 CV 761 Numerical methods in Civil Engineering
10 CV 762 Rock Mechanics
10 CV 763 Pavement Materials and Construction
10 CV 764 Photogrammetry and Remote Sensing
10 CV 765 Air Pollution and Control
10 CV 766 Design and Drawing of Bridges.: * (2 Hrs of Theory + 3 Hrs of Drawing) * (Exam Duration : 4 Hrs)
10 CV 767 Structural Dynamics

SCHEME OF TEACHING AND EXAMINATION
B.E. CIVIL EINGINEERING
VIII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10 CV 81	Advanced Concrete Technology	Civil	04	--	03	25	100	125
2	10 CV 82	Design and Drawing of Steel Structures	Civil	02	03	04	25	100	125
3	10 CV 83x	Elective-IV (Group D)	Civil	04	--	03	25	100	125
4	10 CV 84x	Elective-V (Group E)	Civil	04	--	03	25	100	125
5	10 CV 85	Project Work	Civil	--	06	03	100	100	200
6	10 CV 86	Seminar	Civil	--	03	03	50	--	50
TOTAL				**14**	**12**	**19**	**250**	**500**	**750**

Elective-IV (Group D)

10 CV 831 Advanced Pre-stressed Concrete Structures
10 CV 832 Advanced Foundation Design
10 CV 833 Pavement Design
10 CV 834 Earthquake Resistant Design of Structures
10 CV 835 Industrial Waste Water Treatment
10 CV 836 Construction Management & Engineering Economics.

Elective-V (Group E)

10 CV 841 Finite Element Analysis
10 CV 842 Reinforced Earth Structures
10 CV 843 Urban Transport Planning
10 CV 844 Geographic Information System
10 CV 845 Advanced Design of Steel Structures
10 CV 846 Water Resources Engineering
10 CV 847 Environmental Impact Assessment

ENGINEERING MATHEMATICS – III

CODE: 10 MAT 31 **IA Marks: 25**
Hrs/Week: 04 **Exam Hrs: 03**
Total Hrs: 52 **Exam**
Marks:100

PART-A

Unit-I: FOURIER SERIES

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*
Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis. **[7 hours]**

Unit-II: FOURIER TRANSFORMS

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms
[6 hours]

Unit-III: APPLICATIONS OF PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.
[6 hours]

Unit-IV: CURVE FITTING AND OPTIMIZATION

Curve fitting by the method of least squares- Fitting of curves of the form $y = ax+b$, $y=ax^2 + bx+c$, $y = ae^{bx}$, $y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

[7 hours]

PART-B

Unit-V: NUMERICAL METHODS - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

[6 hours]

Unit-VI: NUMERICAL METHODS – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

[7 hours]

Unit-VII: NUMERICAL METHODS – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations

[7 hours]

<u>Unit-VIII:</u> DIFFERENCE EQUATIONS AND Z-TRANSFORMS

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

[6 hours]

Note: * In the case of illustrative examples, questions are not to be set.

<u>Text Books:</u>

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

<u>Reference Book:</u>

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY (COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

Part-A

UNIT-1

FOUNDATION

Function and requirements of a good foundation, Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil, Introduction to spread, combined, strap, mat and pile foundations, Design of strip and combined footings 6 hours

UNIT-2

MASONRY

Classification of Masonry, Definition of terms used in Masonry, Introduction to classification and qualities of bricks, Bonds in Brick work - English Bond, Flemish Bond, Reinforced, Brick Masonry, Common building stones, their properties and uses, Classification of stone masonry, Joints in stone masonry, Introduction to load bearing, cavity and partition walls. 8 hours

UNIT-3

ARCHES, LINTEL AND BALCONY

Elements of an arch, Classification of arches, Stability of arch, Definition and classification of Lintels, Definition and functions of Chejja, Canopy & Balcony. 6 hours

UNIT-4

ROOFS AND FLOORS

Types of Roofs & Roofing materials, Flat roof (RCC), Types of pitched roofs, Wooden Truss, Steel trusses, Types of flooring, Factors affecting selection of flooring materials. 7 hours

Part-B

UNIT-5

DOORS AND WINDOWS

Location of doors and windows, Definition of technical terms, Types of Doors, Types of windows, Varieties of materials for doors and windows & their properties. 6 hours

UNIT-6

STAIRS

Definition of technical terms, Requirements of ground stair, Types of Stairs, Geometrical design of RCC Dog legged and open well stairs (Plain and sector elevation). 6 hours

UNIT-7

PLASTERING AND PAINTING

Purpose of plastering, Materials of plastering, Methods of plastering, Defects in plastering, Introduction to Paintings and types of Painting, Constituents of paints & types, Purpose of Painting, Defects in Painting, Application of Paints to new and old surfaces. 6 hours

UNIT-8

MISCELLANEOUS TOPICS

Properties and uses of plastics, aluminum, glasses, varnishes, Introduction to smart materials and its application, Introduction to formwork and scaffolding, Formwork details for RCC Column, Beams and Floors, Shoring and under pinning, Damp Proofing - Causes of Dampness, Effects of Dampness, Methods of Damp Proofing 7 hours

TEXT BOOKS

1. **Engineering Materials,** Rangawala P.C. Charter Publishing House, Anand, India.
2. **Engineering Materials,** Sushil Kumar, Standard Publication and Distributors, New Delhi.
3. **Concrete technology – Theory and practice**, M..S. Shetty, S. Chand and Co, New Delhi, 2002.

REFERENCE BOOKS

1. **A Text Book Building Materials**, by P.G. Varghese, Prentice-Hall of India Pvt. Ltd., Publication.
2. **Advances in Building Materials and Construction** by Mohan Rai and M.P. Jain Singh – publication by CBRI, Roorkee.
3. **Concrete Technology,** Neville A.M and Brooks J.J — ELBS Edition. London
4. **Concrete Technology –** Gambhir M.L –Dhanpat Rai and Sons, New Delhi.

STRENGTH OF MATERIALS
(COMMON TO CV/TR/EV/CTM)

Sub Code	:	**10 CV 33**	**IA Marks**	:	**25**
Hrs/ Week	:	**04**	**Exam Hours**	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1:
Simple Stress and Strain

1.1 Introduction, 1.2 Properties of Materials, 1.3 Stress, Strain, Hook’s law, 1.4 Poisson’s Ratio, 15 Stress – Strain Diagram for structural steel and non ferrous materials, 1.6 Principles of superposition, 1.7 Total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self – weight

7 Hours

UNIT 2:
Simple Stress and Strain **continued…**

2.1 Composite section, 2.2 Volumetric strain, expression for volumetric strain, 2.3 Elastic constants, relationship among elastic constants, 2.4 Thermal stresses (including thermal stresses in compound bars).

6 Hours

UNIT 3:

Compound stresses

3.1 Introduction, 3.2 Stress components on inclined planes, 3.3 General two-dimensional stress system, 3.4 Principal planes and stresses, 3.5 Mohr's circle of stresses.

8 Hours

UNIT 4:

Bending moment and shear force in beams

4.1 Introduction, 4.2 Types of beams loadings and supports, 4.3 Shearing force in beam, 4.4 Bending moment, 4.5 Sign convention, 4.6 Relationship between loading, shear force and bending moment, 4.7 Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL and Couple.

7 Hours

PART – B

UNIT 5:

Bending stress, shear stress in beams

5.1 Introduction – Bending stress in beam, 5.2 Assumptions in simple bending theory, 5.3 Pure bending derivation of Bernoulli's equation, 5.4 Modulus of rupture, section modulus, 5.5 Flexural rigidity, 5.6 Expression for horizontal shear stress in beam, 5.7 Shear stress diagram for rectangular, symmetrical 'I' and 'T' section (Flitched beams not included).

6 Hours

UNIT 6:

Deflection of beams

6.1 Introduction – Definitions of slope, deflection, 6.2 Elastic curve-derivation of differential equation of flexture, 6.3 Sign convention 6.4 Slope and deflection for standard loading classes using Macaulay's method for prismatic beams and overhanging beams subjected to point loads, UDL and Couple.

6 Hours

UNIT 7:

Torsion of circular shafts

7.1 Introduction – Pure torsion-torsion equation of circular shafts, 7.2 Strength and stiffness, 7.3 Torsional rigidity and polar modulus, 7.4 Power transmitted by shaft of solid and hollow circular sections.

6 Hours

UNIT 8:

Elastic stability of columns

8.1 Introduction – Short and long columns, 8.2 Euler's theory on columns, 8.3 Effective length slenderness ration, 8.4 radius of gyration, buckling load, 8.5 Assumptions, derivations of Euler's Buckling load for different end conditions, 8.6 Limitations of Euler's theory, 8.7 Rankine's formula and problems.

6 Hours

TEXT BOOKS:

1. **Strength of Materials,** Subramanyam, Oxford University Press, Edition 2008
2. **Mechanics of Materials**, B.C Punmia Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi.
3. **Strength of Materials**, Basavarajaiah and Mahadevappa Universities Press (2009).

REFERENCE BOOKS:

1. **Strength of Materials**, Singer Harper and Row Publications.
2. **Elements of Strength of Materials**, Timoshenko and Young Affliated East-West Press.
3. **Mechanics of Materials,** James M. Gere (5th Edition), Thomson Learning.

SURVEYING – I
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CV 34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction

1.1 Definition of Surveying, 1.2 Classification of Surveys, 1.3 Uses of Surveying Units of Measurements, 1.4 Map & Classification, 1.5 Survey of India topographical Maps and their numbering., 1.6 Basic principles of surveying, 1.7 Errors, Classification, 1.8 Precision and accuracy.

04 Hours

UNIT 2:

Measurement of horizontal distances.

2.1 Chain and types, 2.2 Tape and types, 2.3 EDM devices, 2.3 Ranging of lines 2.4 Direct and Indirect, 2.5 Measurement of distances over sloping grounds, 2.6 Chain and Tape corrections - Numerical problems.

5 Hours

UNIT 3:

Chain Surveying

3.1 Accessories required, 3.2 Selection of stations and lines, 3.3 Offsets and types 3.4 Setting out of right angles, 3.5 Working principle and use of optical square, prism square, cross staff., 3.6 Linear methods of setting out right angles, 3.7 Booking of chain survey work, 3.8 Field book, entries, conventional symbols, 3.9 Obstacles in chain survey, Numerical problems, 3.10 Errors in chain survey and precautions to be taken.

7 Hours

UNIT 4:

Compass Surveying

4.1 Meridians and bearings, 4.2 Principle, working and use of - Prismatic compass 4.3 Surveyor's compass, 4.4 Magnetic bearing, true bearings, 4.5 WCB and Reduced bearing. 4.6 Dip and Declination

4.7 Accessories required for compass surveying, 4.8 Traverse - closed and open traverse 4.9 Computation of bearings of legs of closed traverse given the bearing of one of the legs, 4.10 Computation of included angles given the bearings of legs of a closed traverse.

6 Hours

PART – B

UNIT 5:

Compass Traversing continued….

5.1 Local attraction, determination and corrections, 5.2 Dependent and independent co-ordinates, 5.3 Checks for closed traverse and determination of closing error and its direction 5.4 Bowditch's graphical method of adjustment of closed traverse, 5.5 Bowditch's rule and transit rule, 5.6 Omitted measurements (Only Length and corresponding bearing of one line).

8 Hours

UNIT 6:

Introduction to Levelling

6.1 Principles and basic definitions, 6.2 Fundamental axes and part of a dumpy level, 6.3 Types of adjustments and objectives, 6.4 Temporary adjustments of a dumpy level, 6.5 Sensitiveness of bubble tube, 6.6 Curvature and refraction correction, 6.7 Type of leveling, 6.8 Simple leveling, 6.9 Reciprocal leveling, 6.10 Profile leveling, 6.11 Cross sectioning, 6.12 Fly leveling,

7 Hours

UNIT 7:

Reduction of Levelling continued….

7.1 Booking of levels 7.2 Rise and fall method and Height of instrument method 7.3 comparison Arithmetic checks 7.4 Fly back leveling., 7.5 Errors and precautions.

6 Hours

Contouring

7.6 Contours and their characteristics, 7.7 Methods of contouring, 7.8 direct and indirect methods, 7.9 Interpolation techniques, 7.10 Uses of contours 7.11 Numerical problems on determining intervisibility, 7.12 Grade contours and uses.

4 Hours

UNIT 8:

Plane Table Surveying

8.1 Plane table and accessories, 8.2 Advantages and limitations of plane table survey, 8.3 Orientation and methods of orientation, 8.4 Methods of plotting – Radiation, Intersection, Traversing, 8.5 Resection method, 8.6 Two point and three point problems, 8.7 Solution to two point problem by graphical method, 8.8 Solution to three point problem Bessel's graphical method, 8.9 Errors in plane table survey.

5 Hours

TEXT BOOKS:

1. **'Surveying'** Vol–1 **–** B.C. Punmia , Laxmi Publications, New Delhi.
2. **Surveying and Levelling –** R Subramanian. Oxford University Press (2007)

Text Book of Surveying – C. Venkataramiah. Universities Press.(2009 Reprint)

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REFERENCE BOOKS:

1. **Fundamentals of Surveying -** Milton O. Schimidt – Wong, Thomson Learning.
2. **Fundamentals of Surveying** - S.K. Roy **–** Prentice Hall of India.

3. **Surveying** Vol. I, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
* Survey of India Publication on maps.

10 CV 35 FLUID MECHANICS

Sub. Code: 10CV 35	IA Marks: 25
Hrs/Week : 04	Exam Hours: 03
Total Hrs: 52	Exam Marks: 100

PART-A

UNIT-1: BASIC PROPERTIES OF FLUIDS

Introduction, Definiton of Fluid, Systems of units, properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension,& Capillarity. Newton's law of viscosity (theory & problems).Capillary rise in a vertical tube and between two plane surfaces (theory & problems). **06 Hrs.**

UNIT-2: PRESSURE AND ITS MEASUREMENT

Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Vapour pressre. Measurement of pressure using a simple, differential & inclined manometers (theory & problems). Introduction to Mechanical and electronic pressure measuring devices. **07 Hrs**.

UNIT-3: HYDROSTATIC PRESSURE ON SURFACES

Basic definitions, equations for hydrostatic force and depth of centre of pressure for Vertical and inclined submerged laminae (plane and curved)- Problems. **06 Hrs**

UNIT-4: KINEMATICS OF FLOW

Introduction, methods of describing fluid motion, definitions of types of fluid flow, streamline, pathline, streamtube. Three dimensional continuity equation in Cartesian Coordinates (derivation and problems). General Continuity equation (problems). Velocity potential, Stream function, Equipotential line, Stream line- problems, Physical concepts of Streamfunction. Introduction to flow net.

07 Hrs

PART-B

UNIT-5: DYNAMICS OF FLUID FLOW

Introduction, Energy possessed by a fluid body. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses). Introduction to kinetic energy correction factor. Momentum equation problems on pipe bends.

07 Hrs

UNIT-6: PIPE FLOW

Introduction, losses in pipe flow,. Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion- problems. Water hammer in pipes, equation for pressure rise due to gradual valve closure & sudden closure for rigid and elastic pipes-problems. **07 Hrs**

UNIT-7: DEPTH AND VELOCITY MEASUREMENTS

Introduction, Measurement of depth, point & hook gauges, self recording gauges. Staff gauge, Weight gauge, float gauge. Measurement of velocity- single and double gauges, pitot tube, Current meter- Problems.

06 Hrs

UNIT-8: DISCHARGE MEASUREMENTS

Introduction, Venturimeter, Orificemeter, Rotometer, Venturiflume, Triangular notch, Rectangular notch, Cipolletti notch, Ogee weir and Broad crested weir, Small orifices-Problems. **06 Hrs**

TEXT BOOKS:

1. 'A TextBook of Fluid mechanics & Hydraulic Machines'- R.K.Rajput, S.Chand & Co, New Delhi, 2006 Edition.
2. 'Principles of Fluid Mechanics and Fluid Machines'- N.Narayana Pillai, Universities Press(India), Hyderabad,2009 Edition.
3. ' Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

REFERENCE BOOKS:

1. ' Fundamentals of Fluid Mechanics' – Bruce R. Munson, Donald F.Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
2. 'Introduction To Fluid Mechanics' – Edward j. Shaughnessy,jr; Ira m. Katz:; James p Schaffer, Oxford University Press, New Delhi, 2005 Edition.

3. ‘ Text Book Of Fluid Mechanics& Hydralic Machines’- R.K.Bansal, Laxmi Publications, New Delhi, 2008 Edition.
4. ‘Fluid Mechanics’ – Streeter, Wylie, Bedford New Delhi, 2008(Ed)

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APPLIED ENGINEERING GEOLOGY

Sub Code	**:**	**10 CV-36**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit: 1 - INTRODUCTION:
Geology and its role in the field of civil engineering. Earth: Its internal structure and composition. – 2 hours

MINERALOGY:
Description and identification of Rock forming minerals and Ores, based on physical and special properties;
Quartz and its varieties; Feldspar group; Mica group; carbonate group;
Hornblende, Augite, Olivine, Asbestos, Kaolin, Talc, Gypsum, Garnet, Corundum.
Magnetite, Hematite, Limonite, Pyrite, Chalcopyrite, Pyrolusite, Psilomalane, Chromite, Galena, Bauxite. – 6 hours

Unit: 2- PETROLOGY:
Rocks as fundamental units and building materials of the earth crust and their engineering applications: As building stones, road metals and stones for decoration, pavement, cladding, roofing, flooring, concreting and foundation engineering.

Igneous rocks: Origin, classification (chemical and textural), mode of occurrence; Identification and description of Granite, Syenite, Diorite, Gabbro, Dunite; Pegmatite, Porphiries, Dolerite; Rhyolite, Basalt and Pumice.
Sedimentary rocks: Origin, classification, primary structures and description of Sandstones, Conglomerate, Breccia, Shale, Limestones and Laterite.
Metamorphic rocks: Kinds of metamorphism, description of Gneiss, Quartzite, Marble, Slate, Phyllite and Schists. – 6 hours

Unit: 3-GEOMORPHOLOGY:
Epigene and Hypgene geological agents; rock weathering and its types; Soil formation, types, erosion and remedial measures; Geological action of rivers with different drainage patterns; Geological action of wind. – 5 hours

Unit: 4-GEODYNAMICS:
Earthquakes- seismic waves, seismograph, causes, effects, seismic zones, shield areas and seismic resisting structures. Coastal zones, coastal landforms, continental shelf, continental rise, continental slope, abyssal plain, mid-oceanic ridges, trenches, tsunamis. Land slides; causes, effects and remedial measures – 5 hours

PART B

Unit: 5- ROCK MECHANICS:
Stress, strain and deformational effects on different rocks; Out crop, Dip, strike and escarpment, Clinometer-compass- Joints, faults, folds and unconformities their effects on civil engineering structures. – 6 hours

Unit:6- ENGINEERING GEOLOGY:
Geotechnical investigations for civil engineering projects: Study of toposheets and geological maps, importance of lithological and structural features studies for the construction of Dams, Reservoirs, Tunnels, Bridges and Highways – 6 hours

Unit: 7-HYDROGEOLOGY:
Hydrological cycle; distribution of ground water in the earth crust; properties of water bearing geological formation: Aquifers and their types; selection of sites for well locations and spacing of wells; geological, hydrological and geophysical (electrical resistivity) investigations for ground water exploration; artificial recharge of groundwater methods and rain water harvesting. Sea water intrusion and remedial measures. – 9 hours

Unit:8- GEOMATICS AND ENVIRONMENTAL GEOLOGY:

Introduction to remote sensing (RS), geographical information system (GIS) and global positioning system (GPS); land sate imageries, stereoscopes and their applications in civil engineering. Impact of quarrying, mining and dams on Environment. Quality of ground water in different geological terrain. – 7 hours

QUESTION PAPER PATTERN:

Question paper shall be consisting of eight full questions, selecting four from each part.

The student has to answer any five, selecting at least two from each part.

Each question carry 20 marks.

References books:

1. Text book of Geology by P.K. Mukerjee, World Press Pvt. Ltd. Kolkatta.

1. Foundations of Engineering Geology,by Tony Waltham (3rd Ed.) Universities Press.
2. Structural Geology (3rd Ed.)by M. P. Billings, Published by Prentice Hall of India Pvt. Ltd. New Delhi
3. Text of Engineering and General Geology by Parbin Singh, Published by S. K. Kataria and Sons, New Delhi.
4. Rock Mechanics for Engineers by Dr B.P.Verma, Khanna Publishers, New Delhi.
5. Engineering Geology for Civil Engineering by D. Venkata Reddy, Oxford and IBH Publishing Company, New Delhi.
6. Ground water geology by Todd D.K. John Wiley and Sons, New York.
7. Remote sensing Geology by Ravi P Gupta, Springer Verilag, New York.
8. Physical Geology by Arthur Holmes, Thomson Nelson and Sons, London.
9. Environmental Geology by K. S. Valdiya, Tata Mc Graw Hills.
10. A text book of Engineering Geology by Chenna Kesavulu, Mac Millan India Ltd.
11. Remote sensing and GIS by M.Anji Reddy.
12. Ground water assessment, development and management by K.R.Karanth, Tata Mc Graw Hills

BASIC MATERIAL TESTING LAB
(COMMON TO CV/TR)

Sub Code	**:**	**10 CVL 37**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

1. Tension test on Mild steel and HYSD bars.
2. Compression test of Mild Steel, Cast iron and Wood.
3. Torsion test on Mild Steel circular sections
4. Bending Test on Wood Under two point loading
5. Shear Test on Mild steel.
6. Impact test on Mild Steel (Charpy & Izod)
7. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's
8. Test on Bricks and Tiles
9. Tests on Fine aggregates – Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking
10. Tests on Coarse aggregates – Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis
11. Demonstration of Strain gauges and Strain indicators

NOTE: All tests to be carried out as per relevant BIS Codes

REFERENCE BOOKS:

1. **Testing of Engineering Materials**, Davis, Troxell and Hawk, International Student Edition – McGraw Hill Book Co. New Delhi.
2. **Mechanical Testing of Materials",** Fenner, George Newnes Ltd. London.
3. **"Experimental Strength of Materials"**, Holes K A, English Universities Press Ltd. London.
4. **"Testing of Metallic Materials"**, Suryanarayana A K, Prentice Hall of India Pvt. Ltd. New Delhi.
5. **Relevant IS Codes**
6. **"Material Testing Laboratory Manual"**, Kukreja C B- Kishore K. Ravi Chawla Standard Publishers & Distributors 1996.
7. **Concrete Manual,** M.L.Gambhir –Dhanpat Rai & Sons- New Delhi.

Scheme of Examination:
Group Experiments: Tension, Compression Torsion and Bending Tests
Individual Experiments: Remaining tests

Two questions are to be set – one from group experiments and the other as individual experiment.

SURVEYING PRACTICE – I
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CVL 38**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Exercise – 1
a) To measure distance between two points using direct ranging
b) To set out perpendiculars at various points on given line using cross staff, optical square and tape.

Exercise – 2
Setting out of rectangle, hexagon using tape/chain and other accessories

Exercise – 3
Measurement of bearing of the sides of a closed traverse & adjustment of closing error by Bowdich method and Transit method

Exercise – 4
To set out rectangles, pentagon, hexagon, using tape /chain and compass.

Exercise – 5
To determine the distance between two inaccessible points using chain/tape & compass.

Exercise – 6
To locate points using radiation and intersection method of plane tabling

Exercise – 7
To solve 3-point problem in plane tabling using Bessel's graphical solution

Exercise –8
To determine difference in elevation between two points using fly leveling technique & to conduct fly back leveling. Booking of levels using both HI and Rise & Fall methods.

Exercise – 9
To determine difference in elevation between two points using reciprocal leveling and to determine the collimation error

Exercise – 10

To conduct profile leveling for water supply /sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level.

Demonstration
Minor instruments – Clinometer, Ceylon ghat tracer, Hand level, Box sextant, Planimeter and Pantagraph.

Scheme of Examination:
Any one of the above exercise is to be conducted in the examination by the student.

TEXT BOOKS:

1. **'Surveying'** Vol.–1, B.C. Punmia , Laxmi Publications, New Delhi.

2. **"Plane Surveying'** Vol-1-A.M. Chandra , Newage International ® Ltd.

3. **'Plane Surveying'** – ALAK , S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS :

1. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India.

2. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

4. **Surveying** Vol. I, S.K. Duggal

ENGINEERING MATHEMATICS – IV

CODE: 10 MAT 41 **IA Marks: 25**
Hrs/Week: 04 **Exam Hrs: 03**
Total Hrs: 52 **Exam Marks:100**

PART-A

<u>Unit-I:</u> NUMERICAL METHODS - 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

[6 hours]

<u>Unit-II:</u> NUMERICAL METHODS – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.
Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

[6 hours]

<u>Unit-III:</u> Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.
Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

[7 hours]

<u>Unit-IV:</u> Complex variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals-Cauchy's theorem and Cauchy's integral formula.

[7 hours]

PART-B

Unit-V: SPECIAL FUNCTIONS

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

[7 hours]

Unit-VI: PROBABILITY THEORY - 1

Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

[6 hours]

Unit-VII: PROBABILITY THEORY- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

[7 hours]

Unit-VIII: SAMPLING THEORY

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

[6 hours]

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

CONCRETE TECHNOLOGY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CV 42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

Unit- 1
Cement, Chemical composition, hydration of cement, Types of cement, manufacture of OPC by wet and dry, process (flow charts only) Testing of cement - Field testing, Fineness by sieve test and Blaine's air permeability test, Normal consistency, testing time, soundness, Compression strength of cement and grades of cement, Quality of mixing water. –7 Hours

Unit-2
Fine aggregate - grading, analysis, Specify gravity, bulking, moisture content, deleterious materials. Coarse aggregate – Importance of size, shape and texture.Grading of aggregates - Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. - 6 Hours

Unit-3

Workability - factors affecting workability, Measurement of workability - slump, flow tests, Compaction factor and vee-bee consistometer tests, Segregation and bleeding, Process of manufactures of concrete : Batching, Mixing, Transporting, Placing, Compaction, Curing. -7 Hours

Unit-4

Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures - Fly ash, Silica fumes and rice husk ash.

-6 Hours

Part-B

Unit-5

Factors affecting strength, w/c ratio, gel/space ratio, maturity concept, Effect of aggregate properties, relation between compressive strength, and tensile strength, bond strength, modulus of rupture, Accelerated curing, aggregate - cement bond strength, Testing of hardened concrete - compressive strength, split tensile strength, Flexural strength, factors influencing strength test results. - 6Hours

Unit-6

Elasticity - Relation between modulus of elasticity and Strength, factors affecting modulus of elasticity, Poisson , Ratio, Shrinkage - plastic shrinkage and drying shrinkage, Factors affecting shrinkage, Creep - Measurement of creep, factors affecting creep, effect of creep, - 7 Hours

Unit-7

Durability - definition, significance, permeability, Sulphate attack, Chloride attack, carbonation, freezing and thawing, Factors contributing to cracks in concrete - plastic shrinkage, settlement cracks, construction joints, Thermal expansion, transition zone, structural design deficiencies, - 6 Hours

Unit-8

Concept of Concrete Mix design, variables in proportioning , exposure conditions, Procedure of mix design as per IS 10262-1982, Numerical examples of Mix Design - 7 Hours

TEXT BOOKS:

1. "Concrete Technology" - Theory and Practice, M.S.Shetty, S.Chand and Company, New Delhi, 2002.

REFERENCES :

1. "Properties of Concrete"Neville, A.M. : , ELBS, London
2. "Concrete Technology" – A.R.Santakumar. Oxford University Press (2007)'
3. "Concrete Manual" - Gambhir Dhanpat Rai & Sons, New Delhi.
4. "Concrete Mix Design" - N.Krishna Raju, Sehgal - publishers.
5. "Recommended guidelines for concrete mix design" - IS:10262,BIS Publication

STRUCTURAL ANALYSIS –I
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
STRUCTURAL SYSTEMS AND ENERGY CONCEPT
1.1 Forms of structures, 1.2 Conditions of equilibrium, 1.3 Degree of freedom, 1.4 Linear and Non linear structures, 1.5 One, two, three dimensional structural systems, 1.6 Determinate and indeterminate structures [Static and Kinematics]. 1.7 Strain energy and complimentary strain energy, 1.8 Strain energy due to axial load, bending and shear, 1.9 Theorem of minimum potential energy, 1.10 Law of conservation of energy, 1.11 Principle of virtual work,

7 Hours

UNIT 2:
DEFLECTION OF BEAMS
2.1 Moment area method, 2.2 Conjugate beam method

6 Hours

UNIT 3:
DEFLECTION OF BEAMS AND FRAMES BY STRAIN ENERGY
3.1 The first and second theorem of Castigliano, problems on beams, frames and trusses, 3.2 Betti's law, 3.3 Clarke - Maxwell's theorem of reciprocal deflection.

7 **Hours**

UNIT 4:
ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY
4.1 Analysis of beams (Propped cantilever and Fixed beams) and trusses using strain energy and unit load methods

7 Hours

PART – B

UNIT 5:

ARCHES AND CABLES

5.1 Three hinged circular and parabolic arches with supports at same levels and different levels, 5.2 Determination of thrust, shear and bending moment, 5.3 Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

6 Hours

UNIT 6:

ANALYSIS OF BEAMS

6.1 Consistent deformation method – Propped cantilever and fixed beams

6 Hours

UNIT 7:

7.1 Clapeyron's theorem of three moments – continuous beams and fixed beams

6 Hours

UNIT 8:

ANALYSIS OF ARCHES

8.1 Two hinged parabolic arch, 8.2 Two hinged Circular Arch

7 Hours

TEXT BOOKS:

1. **Theory of Structures**, Pandit and Guptha, Vol. – I, Tata McGraw Hill, New Delhi.
2. **Basic Structural Analysis** Reddy C. S., Tata McGraw Hill, New Delhi.
3. **Strength of Materials and theory of structures** Vol I & II, B.C. Pumia , R.K., Jain Laxmi Publication New Delhi

REFERENCE BOOKS:

1. **Elementary Structural Analysis**, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
2. **Structural Analysis**, 4th SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.
3. **Analysis of Structures**, Thandava Murthy, Oxford University Press, Edition 2005.

SURVEYING – II
(COMMON TO CV/TR/EV/CTM)

Sub Code	**:**	**10 CV 44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
THEODOLITE SURVEY
1.1 Thedolite and types, 1.2 Fundamental axes and parts of a transit theodolite, 1.3 Uses of theodolite, 1.4 Temperary adjustments of a transit thedolite, 1.5 Measurement of horizontal angles – Method of repetitions and reiterations, 1.6 Measurements of vertical angles, 1.7 Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment

6 Hours

UNIT 2:
PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE
2.1 Interrelationship between fundamental axes for instrument to be in adjustment and step by step procedure of obtaining permanent adjustments

7 Hours

UNIT 3:
TRIGONOMETRIC LEVELING
3.1 Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, 3.2 Distance and difference in elevation between two inaccessible objects by double plane method. Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

8 Hours

UNIT 4:
TACHEOMETRY
4.1 Basic principle, 4.2 Types of tacheometric survey, 4.3 Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, 4.4 Anallactic lens in external focusing telescopes, 4.5 Reducing the constants in internal focusing telescope, 4.6 Moving hair method and

tangential method, 4.7 Subtance bar, 4.8 Beaman stadia arc.

7 Hours

PART – B

UNIT 5:

CURVE SETTING (Simple curves)

5.1 Curves – Necessity – Types, 5.2 Simple curves, 5.3 Elements, 5.4 Designation of curves, 5.5 Setting out simple curves by linear methods, 5.6 Setting out curves by Rankines deflection angle method.

6 Hours

UNIT 6:

CURVE SETTING (Compound and Reverse curves)

6.1 Compound curves 6.2 Elements 6.3 Design of compound curves 6.4 Setting out of compound curves 6.5 Reverse curve between two parallel straights (Equal radius and unequal radius).

6 Hours

UNIT 7:

CURVE SETTING (Transition and Vertical curves)

7.1 Transition curves 7.2 Characteristics 7.3 Length of Transition curve 7.4 Setting out cubic Parabola and Bernoulli's Lemniscates, 7.5 Vertical curves – Types – Simple numerical problems.

6 Hours

UNIT 8:

AREAS AND VOLUMES

8.1 Calculation of area from cross staff surveying, 8.2 Calculation of area of a closed traverse by coordinates method. 8.3 Planimeter – principle of working and use of planimeter to measure areas, digital planimter, 8.4 Computations of volumes by trapezoidal and prismoidal rule, 8.5 Capacity contours

6 Hours

TEXT BOOKS:

1.'**Surveying'** Vol 2 and Vol 3 - B. C. Punmia, Laxmi Publications
2**.'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3**.'Higher Surveying'** A.M. Chandra New age international (P) Ltd

REFERENCE BOOKS:

1. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.

2. **Fundamentals of Surveying** - S.K. Roy – Prentice Hall of India
3. **Surveying**, Arther Bannister et al., Pearson Education, India

HYDRAULICS & HYDRAULIC MACHINES
(COMMON TO CV/TR/EV)

Sub Code	**:**	**10 CV 45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A

UNIT-1: DIMENSIONAL ANALYSIS AND MODEL STUDIES

Introduction, Systems of units, Dimensions of quantities, Dimensional Homogeneity of an equation. Analysis- Raleigh's method, Buckingham's Π theorem- problems.
Model Studies, Similitude, Non-dimensional numbers: Froude models-Undistorted and Distorted models. Reynold's models-Problems **07 hrs**

UNIT-2: UNIFORM FLOW IN OPEN CHANNELS

Introduction, Geometric properties of Rectangular, Triangular, Trapezoidal and Circular channels. Chezy's equation, Manning's equation-problems.
Most economical open channels-Rectangular, Triangular, Trapezoidal and Circular channeles- problems.

06 Hrs

UNIT-3: NON-UNIFORM FLOW IN OPEN CHANNELS

Introduction, Specific energy, Specific energy diagram, Critical depth, Conditions for Critical flow- Theory & problems.

Hydraulic jump in a Horizontal Rectangular Channel- Theory and problems.
Dynamic equation for Non-Uniform flow in an Open channel, Classification of Surface profiles- simple Problems.

07 Hrs

UNIT-4: IMPACT OF JET ON FLAT VANES

Introduction, Impulse- Momentum equation. Direct impact of a jet on a stationary flat plate, Oblique impact of a jet on a stationary flat plate, Direct impact on a moving plate, Direct impact of a jet on a series of a jet on a series of flat vanes on a wheel. Conditions for maximum hydraulic efficiency. Impact of a jet on a hinged flat plate- problems.

06 Hrs

PART-B

UNIT-5: IMPACT OF JET ON CURVED VANES

Introduction, Force exerted by a jet on a fixed curved vane, moving curved vane.
Introduction to concept of velocity triangles, Impact of jet on a series of curved vanes-problems.

06 Hrs

UNIT-6: PELTON WHEEL

Introduction to Turbines, Classification of Turbines. Pelton wheel- components, working and velocity triangles. Maximum power, efficiency, working proportions- problems.

07 Hrs

UNIT-7: KAPLAN TURBINES

Introduction, Components, Working and Velocity triangles, Properties of the Turbine, Discharge of the Turbines, Number of Blades-Problems. Draft Tube: Types, efficiency of a Draft tube. Introduction to Cavitation in Turbines.

07 Hrs

UNIT-8: CENTRIFUGAL PUMPS

Introduction, Classification, Priming, methods of priming. Heads and Efficiencies. Equation for work done, minimum starting speed, velocity triangles. Multistage Centrifugal Pumps (Pumos in Series and Pumps in parallel). Characteristic Curves for a Single stage Centrifugal Pumps- problems.

06 Hrs

TEXT BOOKS:

4. ‘A TextBook of Fluid mechanics & Hydraulic Machines’- R.K.Rajput, S.Chand & Co, New Delhi, 2006 Edition.
5. ‘ Text Book Of Fluid Mechanics& Hydralic Machines’- R.K.Bansal, Laxmi Publications, New Delhi, 2008 Edition.
3. ‘ Fluid Mechanics and Turbomachines’- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

REFERENCE BOOKS:

5. ‘ Introduction to Fluid Mechanics’ – Robert w. Fox: Philip j. Pritchard: Alan t. McDonald, Wiley India, New Delhi, 2009 Edition.
6. ‘Introduction To Fluid Mechanics’ – Edward j. Shaughnessy,jr; Ira m. Katz:; James p Schaffer, Oxford University Press, New Delhi, 2005 Edition.

7. ‘Hydraulics and Fluid Mrchanics’ – Dr. P.N. Modi& Dr S.M. Seth, Standard Book House- New Delhi. 2009 Edition..

BUILDING PLANNING AND DRAWING
(COMMON TO CV/TR)

Sub Code	**:**	**10 CV 46**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**06 (3 x 2 = 6) Practical**	**Exam Hours**	**:**	**04**
		01 Theory	**Exam Marks**	**:**	**100**

1. To prepare geomatrical drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) Fully paneled and flush doors, iii) Half paneled and half-glazed window, iv) RCC dog legged and open well stairs, v) Steel truss.

15 Hours

2. Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.

9 Hours

3. Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two bed room building, ii) Two storeyed building.

27 Hours

4 Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for fallowing building i) Primary health centre, ii) Primary school building, iii) College canteen iv) Office building

12 Hours

5 For a given single line diagram, preparation of water supply, sanitary and electrical layouts

6 Hours

REFERENCE BOOKS:

1 **“Building Drawing”**, Shah M.H and Kale C.M, Tata Mc Graw Hill Publishing co. Ltd., New Delhi.

2 **“Building Construction”,** Gurucharan Singh, Standard Publishers &distributors,New Delhi.
3 **National Building Code**, BIS, New Delhi.

IA MARKS

15 Marks for term work.
10 Marks for a test conducted at the end of the semester of 4hrs duration on the Line of VTU examination.

TERM WORKS DETAILS:

Sheet No:	**1 to 4 from chapter No1**
Sheet No:	**5 to 8 from chapter No3**
Sheet No:	**9 to 13from chapter No4**
Sheet No:	**14 &15from chapter No5**

SCHEME OF EXAMINATION

Section-I Compulsory question from chapter No 3 for 60 Marks

Plan……………………….25
Elevation…………………15
Section…………………...15
Schedule of opening……..05
60

Section-II Four questions from chapters 1, 2, 4 and 5 should be set, out of which two have to be answered (20 x 2 = 40 Marks).

Note: No theory question shall be asked from any chapter.

SURVEYING PRACTICE – II LABORATORY
(COMMON TO CV/TR/CTM)

Sub Code	**:**	**10 CVL 47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Exercise – 1
Measurement of horizontal angles with method of repetition and reiteration using theodolite, Measurement of vertical angles using theodolite.

Exercise – 2
To determine the elevation of an object using single plane method when base is accessible and inaccessible.

Exercise – 3
To determine the distance and difference in elevation between two inaccessible points using double plane method.

Exercise – 4
To determine the tachemetric constants using horizontal and inclined line of sight.

Exercise – 5
To set out simple curves using linear methods – perpendicular offsets from long chord and offsets from chords produced.

Exercise – 6
To set out simple curves using Rankine's deflection angles method.

Exercise – 7
To set out compound curve with angular methods with suing theodolite only.

Exercise – 8
To set out the center line of a simple rectangular room suing offset from base line

Exercise – 9
To set out center lines of columns of a building using two base lines at right angles

Demonstration
Exposure to use of Total Station. Traversing, Longitudinal sections, Block levelling, Usage of relevant softwares for preparation of the contour drawings.

Scheme of Examination:
Any one of the above exercise is to be conducted in the examination by the student.

APPLIED ENGINEERING GEOLOGY LABORATORY
(COMMON TO CV/TR)

Sub Code	**:**	**10 CVL 48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**

Total Hrs. : 42 Exam Marks : 50

1.Describe and identify the minerals based on their physical, special properties, chemical composition and uses. Study of important rock forming minerals, ores and other important industrial minerals. (As per the III semester theory syllabus) – 2 practicals

2.Describe and identify the rocks as per the theory syllabus by giving their physical properties and engineering uses. – 2 practicals

3.Study of Geological maps and their sections: interpreting them in terms of selecting the sites for various civil engineering structures. - 3 practicals

4.Dip and strike (surface method) problems: To find out the dip and strike of the geological formation to select suitable site for civil engineering structures. – 2 practicals

5.Borehole problems (sub surface dip and strike): three point level ground methods: - 2 practicals

6.Thickness of strata (out crops) problems: To determine the true thickness, vertical thickness and the width of the out crops on different topographical terrain. – 1 practical

7. Filed visit to Civil engineering projects –Dams, Reservoirs, Harbours etc. – 3 days

<u>Scheme of Examination</u>

1. Identification of Minerals (5 Nos.): 5x2 : 10 marks
2. Identification of Rocks (5Nos.): 5x2 : 10 marks
3. Geological Map: 1x 15 : 15 marks
4. Borehole Problems: 1x 05 : 05 marks
5. Dip and Strike Problems: 1x04 : 04 marks
6. Thickness of strata problems: 1x03 : 03 marks
7. Viva- Voce: 03 marks

I.A. Marks should be assessed by conducting a test for 10 Marks and 15 Marks for practical record. (Total Marks: 25)

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V SEMESTER

MANAGEMENT & ENTREPRENEURSHIP

Subject Code	**: 10AL51**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management – Management as a science, art or profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

ORGANIZING AND STAFFING: Nature and purpose of organization – principles of organization – Types of organization – Departmentation – Committees – Centralisation Vs Decentralisation of authority and responsibility – Span of control – MBO and MBE (Meaning only) Nature and importance of Staffing – Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – Coordination, meaning and importance and Techniques of Co-ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).

7 Hours

PART - B

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur, Evolution of Concept, Functions of Entrepreneur, Types of Entrepreneur, Entrepreneur – An emerging class. Concept of Entrepreneurship – Evolution of Entrepreneurship, Development of Entrepreneurship, Stages in entrepreneurial process, Role of Entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

7 Hours

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives, Scope, role of SSI in Economic Development. Advantages of SSI. Steps to start an SSI – Government policy towards SSI, Different Policies of SSI., Government Support on SSI., during 5 year plans. Impact of Liberalization, Privatisation, Globalization on SSI. Effect of WTO / GATT Supporting Agencies of Government for SSI Meaning. Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only).

7 Hours

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes, TECKSOK, KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI, NSIC, SIDBI, KSFC.

6 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project, Project Identification, Project Selection, Project Report, Need and significance of Project, Contents, formulation, Guidelines by Planning Commission for Project Report, Network Analysis, Errors of Project Report, Project Appraisal. Identification of Business Opportunities. Market Feasibility Study: Technical Feasibility Study, Financial Feasibility Study & Social Feasibility Study.

6 Hours

TEXT BOOKS:

1. **Principles of Management** – P.C. Tripathi, P.N. Reddy, Tata McGraw Hill.
2. **Dynamics of Entrepreneurial Development & Management –** Vasant Desai – Himalaya Publishing House

3. **Entrepreneurship Development** – Small Business Enterprises – Poornima M. Charantimath – Pearson Education – 2006.

REFERENCE BOOKS:

1. **Management Fundamentals** – Concepts, Application, Skill Development – Robert Lusier – Thomson.
2. **Entrepreneurship Development** – SS Khanka – S Chand & Co.
3. **Management** – Stephen Robbins – Pearson Education / PHI – 17th Edition, 2003.
4. **Management & Entrepreneurship** by N V R Naidu & T Krishna Rao – I K International Publishing House Pvt. Ltd. 1st edition

DESIGN OF RCC STRUCTURAL ELEMENTS

Subject Code	**: 10CV52**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength.

6 Hours

UNIT - 2

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length.

7 Hours

UNIT - 3

FLEXURE AND SERVICEABILITY LIMIT STATES: General Specification for flexure design of beams-practical requirements, size of beam, cover to reinforcement-spacing of bars. General aspects of serviceability-Deflection limits in IS: 456 – 2000-Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

6 Hours

UNIT - 4

DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections.

8 Hours

PART - B

UNIT - 5

DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

8 Hours

UNIT - 6

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16 charts.

5 Hours

UNIT - 7

DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal.

6 Hours

UNIT - 8

DESIGN OF STAIR CASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. With waistslabs.

6 Hours

REFERENCE BOOKS:

1. **Limit State Design of Reinforced concrete-**by P.C. Varghese, PHI Learning Private Limited 2008-2009
2. **Fundamentals of Reinforced concrete Design-**by M.L.Gambhir, PHI Learning Private Limited 2008-2009.
3. **Reinforced concrete Design-**by Pallai and Menon, TMH Education Private Limited,
4. **Reinforced concrete Design-**by S.N.Shinha, TMH Education Private Limited,

5. **Reinforced concrete Design**-by Karve & Shaha, Structures Publishers Pune.
6. **Design of RCC Structural Elements** S. S. Bhavikatti, Vol-I, New Age International Publications, New Delhi.
7. **IS-456-2000 and SP-16**

STRUCTURAL ANALYSIS – II

Subject Code	**: 10CV53**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ROLLING LOAD AND INFLUENCE LINES: Rolling load analysis for simply supported beams for several point loads and UDL.

Influence line diagram for reaction, SF and BM at a given section for the cases mentioned in above uinit 1

6 Hours

UNIT - 2

SLOPE DEFLECTION METHOD: Introduction, Sign convention, Development of slope-deflection equations and Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)

8 Hours

UNIT - 3

MOMENT DISTRIBUTION METHOD: Introduction, Definition of terms-Distribution factor, Carry over factor, Development of method and Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)

8 Hours

UNIT - 4

SWAY ANALYSIS: Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy $\leq$ 3) by slope deflection and moment distribution methods.

4 Hours

PART - B

UNIT - 5

*KANIS METHODS**: Introduction, Basic Concept, Analysis of Continuous beams and Analysis of rigid jointed non-sway plane frames.***

6 Hours

UNIT - 6

FLEXIBILITY MATRIX METHOD OF ANALYSIS: **Introduction, Development of flexibility matrix for plane truss element and axially rigid plane framed structural elements and Analysis of plane truss and axially rigid plane frames by flexibility method with static indeterminacy ≤3.** 7 Hours

UNIT - 7

STIFFNESS MATRIX METHOD OF ANALYSIS**: Introduction, Development of stiffness matrix for plane truss element and axially rigid plane framed structural elements. And Analysis of plane truss and axially rigid plane frames by stiffness method with kinematic indeterminacy ≤3.**

7 Hours

UNIT - 8

BASIC PRINCIPLES OF DYNAMICS**: Basic principles of Vibrations and causes, periodic and aperiodic motion, harmonic and non-harmonic motion. Period and frequency.**

Forced and Free Vibration, Damping and Equations of Single Degree of Freedom System with and without damping

6 Hours

REFERENCE BOOKS:

1. **Basic Structural Analysis**- Reddy C.S. - Second Edition, Tata McGraw Hill Publication Company Ltd.
2. **Theory of Structures Vol. 2** - S.P. Gupta, G.S. Pandit and R. Gupta, Tata McGraw Hill Publication Company Ltd.
3. Structural Dynamics-by M.Mukhopadhyay,
4. **Structural Analysis-II** -S. S. Bhavikatti – Vikas Publishers, New Delhi.
5. **Basics of Structural Dynamics and Aseismic Design** By Damodhar Swamy and Kavita PHI Learning Private Limited
6. **Structural Analysis**- D.S. Prakash Rao,, A Unified Approach, University Press
7. **Structural Analysis**, 4^{th} SI Edition by Amit Prasanth & Aslam Kassimali, Thomson Learning.

GEOTECHNICAL ENGINEERING – I

Subject Code	**: 10CV54**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT- 1

INTRODUCTION: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Water content, Specific Gravity of soil solids and soil mass, Densities and Unit weights - Bulk, Dry, Saturated & Submerged and their inter relationships.

6 Hours

UNIT - 2

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION: Index Properties of soil- Water content , Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soil: Water content (Oven Drying method & Rapid Moisture method), Specific gravity of soil solids (Pycnometer and density bottle method), Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- (Casagrande and Cone penetration methods), Plastic limit and shrinkage limit.

7 Hours

UNIT - 3

CLASSIFICATION OF SOILS: Purpose of soil classification, Particle size classification – MIT classification and IS classification, Textural classification. IS classification - Plasticity chart and its importance, Field identification of soils.

CLAY MINERALOGY AND SOIL STUCTURE: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

8 Hours

UNIT - 4

FLOW OF WATER THROUGH SOILS: Darcy’s law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, quick sand phenomena, Capillary Phenomena**.**

6 Hours

PART - B

UNIT - 5

SHEAR STRENGTH OF SOIL: Concept of shear strength, Mohr-coulomb theory, conventional and modified failure envelops, Effective stress concept-total stress, effective stress and Neutral stress, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay.

7 Hours

UNIT - 6

COMPACTION OF SOIL: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control – compactive effort & method, lift thickness and number of passes, Proctor's needle, Compacting equipment.

6 Hours

UNIT - 7

CONSOLIDATION OF SOIL: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v).

UNIT- 8

DETERMINATION OF SHEAR STRENGTH AND CONSOLIDATION OF SOIL: Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions.

Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method).

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engg**.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. **Principles of Soil Mechanics and Foundation Engineering**-Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.

3. **Geotechnical Engineering**; Braja, M. Das (2002), Fifth Edition, Thomson Business Information India (P) Ltd., India

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.
2. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Donold P Coduto Phi Learning Private Limited, New Delhi
5. **Geotechnical Engineering**- Shashi K. Gulathi & Manoj Datta. (2009), " Tata Mc Graw Hill.
6. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005),, 2nd Edition, PHI, India.
7. **Numerical Problems, Examples and objective questions in Geotechnical Engineering**- Narasimha Rao A. V. & Venkatrahmaiah C. (2000), Universities Press., Hyderabad.

Hydrology and Irrigation Engineering

Sub Code	**:**	**10CV55**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A
HYDROLOGY

UNIT 1: INTRODUCTION & PRECIPITATION

Introduction ,Hydrologic cycle (Horton's representation). Water budget equation

Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of raingauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall, 07 hrs

UNIT 2 : LOSSES FROM PRECIPITATION

Evaporation: Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rohwer's equation), evaporation control.
Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaney criddle method)
Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration. 07 hrs

UNIT 3: HYDROGRAPHS
Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems
06 hrs

UNIT 4: ESTIMATION OF FLOOD & FLOOD ROUTING
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).
Flood routing: Introduction to hydrological routing, relationship of out flow and storage, general storage equation, Muskingum routing method. 07 hrs

PART-B
IRRIGATION ENGINEERING

UNIT 5 : INTRODUCTION
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tube well irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.
06 hrs

UNIT 6: SOIL-WATER-CROP RELATIONSHIP

Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.
06 hrs

UNIT 7: WATER REQUIREMENT OF CROPS

Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

07 hrs

Unit 8: Canals

Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems
06 hrs

TEXT BOOKS:

1. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)

2. Hydrology- Madan Mohan Das, Mim Mohan Das-PHI Learning private Ltd. New Delhi-2009 (Ed)

3. A Text Book Of Hydrology- Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)

4. Irrigation, water Resources and water power Engineering- P.N.Modi- standard book house, New Delhi.

5. Irrigation and Water Power Engineering-Madan Mohan Das & Mimi Das Saikia; PHILearning pvy. Ltd. New Delhi 2009 (Ed).

REFERENCE BOOKS:

1. Hydrology & Soil Conservation Engineering- Ghanshyam Das- PHI Learning Private Ltd., New Delhi- 2009 (Ed)

2. Hydrology & Water Resources Engineering- Patra K.C. Narosa Book Distributors Pvt. Ltd. New Delhi-2008 (Ed)

3. Hydrology & Water Resources Engineering- R.K.Sharma & Sharma, Oxford and Ibh, New Delhi

4. Irrigation Engineering and Hydraulic structures- S. K. garg- Khanna Publication, New Delhi.

TRANSPORTATION ENGINEERING I

Subject Code :10CV56
I A Marks :25
No. of lecture Hours/week :04
Exam Hours :03
Total No. of Lecture Hours :52
Exam Marks :100

PART – A

UNIT – 1

PRINCIPLES OF TRANSPORTATION ENGINEERING: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute

04 Hrs

UNIT – 2

HIGHWAY DEVELOPMENT AND PLANNING: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year road development plans and Policies, Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - vision 2021. **06 Hrs**

UNIT – 3

HIGHWAY ALIGNMENT AND SURVEYS: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects **04 Hrs**

HIGHWAY GEOMETRIC DESIGN – I: Importance, Terrain classification, Design speed, Factors affecting geometric design, **Cross sectional elements**-Camber- width of pavement-Shoulders-, Width of formation- Right of way, Typical cross sections **05 Hrs**

UNIT – 4

HIGHWAY GEOMETRIC DESIGN – II: Sight Distance-Restrictions to sight distance- Stopping sight distance-Overtaking sight distance- overtaking zones- Examples on SSD and OSD- Sight distance at intersections, **Horizontal alignment**-Radius of Curve- Superelevation – Extra widening-Transition curve and its length, setback distance – Examples, **Vertical alignment**-Gradient-summit and valley curves with examples. **07 Hrs**

PART - B

UNIT – 5

PAVEMENT MATERIALS: Subgrade soil - desirable properties-HRB soil classification-determination of CBR and modulus of subgrade reaction-Examples on CBR and Modulus of subgrade reaction, **Aggregates-** Desirable properties and list of tests, **Bituminous materials**-Explanation on Tar, bitumen,cutback and emulsion-List of tests on bituminous materials **06 Hrs**

UNIT – 6

PAVEMENT DESIGN: Pavement types, component parts of flexible and rigid pavements and their functions,design factors, ESWL and its determination-Examples, **Flexible pavement**-Design of flexible pavements as per IRC;37-2001-Examples, **Rigid pavement**- Westergaard's equations for load and temperature stresses- Examples- Design of slab thickness only as per IRC:58-2002

06 Hrs

UNIT – 7

PAVEMENT CONSTRUCTION: Earthwork –cutting-Filling, Preparation of subgrade, Specification and construction of i) Granular Subbase, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads **05 Hrs**

HIGHWAY DRAINAGE: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials

03 Hrs

UNIT – 8

HIGHWAY ECONOMICS: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods-Examples, Highway financing-BOT-BOOT concepts

06 Hrs

TEXT BOOKS:

1. **Highway Engineering –** S K Khanna and C E G Justo, Nem Chand Bros, Roorkee

2. **Highway Engineering** - L R Kadiyali, Khanna Publishers, New Delhi
3. **Transportation Engineering –** K P Subramanium, Scitech Publications, Chennai
4. **Transportation Engineering – James** H Banks, Mc. Graw. Hill Pub. New Delhi
5. **Highway Engineeering –**R. Sreenivasa Kumar, University Press. Pvt.Ltd. Hyderabad

REFERENCE BOOKS:

1. **Relevant IRC Codes**
2. **Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.**
3. **Transportation Engineering –** C. Jotin Khisty, B. Kent lal, PHI Learning Pvt. Ltd. New Delhi.

HYDRAULICS AND HYDRAULICS MACHINERY LABORATORY

Sub Code	**:**	**10CV 57**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**100**

1. Calibration of collecting tank (gravimetric method)
2. Calibration of pressure gauge (dead weight method)
3. Verification of Bernoulli’s equation
4. Calibration of 90^0 V-notch
5. Calibration of Rectangular and Cipolletti notch
6. Calibration of Broad- crested weir
7. Calibration of Venturiflume
8. Calibration of Venturimeter
9. Determination of Darcy’s friction factor for a straight pipe
10. Determination of Hydraulic coefficients of a vertical orifice
11. Determination of vane coefficients for a flat vane & semicircular vane

12. Performance characteristics of a single stage centrifugal pump
13. Performance characteristics of a Pelton wheel
14. Performance characteristics of a Kaplan turbine

Reference:

Experiments in Fluid Mechanics – Sarbjit Singh- PHI Pvt. Ltd.- NewDelhi- 2009-12-30
Hydraulics and Hydraulic Mechines Laboratory Manual – Dr. N. Balasubramanya

COMPUTER AIDED DESIGN LABORATORY

Subject Code	**: 10CVL58**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. AUTOCAD

1.1 **Basics of AUTOCAD**:

DRAWING TOOLS: Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse, *Modify tools*: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, *Using Text*: Single line text, Multiline text, Spelling, Edit text, *Special Features*: View tools, Layers concept, Dimension tools, Hatching, Customising toolbars, Working with multiple drawings

3 Hours

1.2 **Use of AUTOCAD in Civil Engineering Drawings**:

Following drawings are to be prepared for the data given using AUTOCAD

i) Cross section of Foundation - masonry wall, RCC columns (isolated)
ii) Different types of staircases
iii) Lintel and chajja
iv) RCC slabs and beams
v) Drawing of Plan, elevation and sectional elevation of single storied residential and public buildings given the single line diagram and preparing excavation plan.

18 Hours

2. STRUCTURAL ANALYSIS SOFTWARE

Use of commercially available software for the analysis of

i) Plane Trusses

ii) Continuous beams
iii) 2D Portal frames-single storied and multistoried

9Hours

3. USE OF EXCEL IN CIVIL ENGINEERING PROBLEMS

Use of spread sheet for the following civil engineering problems

i) SFD and BMD for Cantilever and simply supported beam subjected to uniformly distributed and uniformly varying load acting throughout the span
ii) Design of singly reinforced and doubly reinforced rectangular beams
iii) Computation of earthwork
iv) Design of horizontal curve by offset method
v) Design of super elevation

12 Hours

REFERENCE BOOKS:

1. **Computer Aided Design Laborator-** Dr M.N.Shesha Prakash, Dr.G.S.Suresh, Lakshmi Publications
2. **CAD Laboratory**- M.A.Jayaram, D.S.Rajendra Prasad- Sapna Publications
3. **AUTOCAD 2002-** Roberts JT, -BPB publications
4. **AUTOCAD 2004-** Sham Tickoo, A beginner's Guide, Wiley Dreamtech India Pvt Ltd.,
5. **Learning Excel 2002-** Ramesh Bangia, -Khanna Book Publishing Co (P) Ltd.,
6. **Microsoft Excel-** Mathieson SA, Starfire publishers

VI SEMESTER

ENVIRONMENTAL ENGINEERING-I

Subject Code	: 10CV61	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

Unit - 1

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply.

2 Hours

DEMAND OF WATER: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters formula, peak factors, design periods & factors governing the design periods

6 Hours

Unit - 2

SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.

3 Hours

COLLECTION AND CONVEYANCE OF WATER: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.

6 Hours

Unit - 3

QUALITY OF WATER: Objectives of water quality management. wholesomeness & palatability, water borne diseases. Water quality parameters – Physical, chemical and Microbiological. Sampling of water for examination. Water quality analysis (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. and toxic / trace organics.

6 Hours

Unit - 4

WATER TREATMENT: Objectives – Treatment flow-chart. Aeration- Principles, types of Aerators.

2 Hours

SEDIMENTATION: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing, and clari-flocculator.

4 Hours

Part - B

Unit - 5

FILTRATION: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters. Operational problems in filters.

6 Hours

Unit - 6

DISINFECTION: Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV irradiation treatment – treatment of swimming pool water

4 Hours

SOFTENING – definition, methods of removal of hardness by lime soda process and zeolite process RO & Membrane technique.

3 Hours

Unit - 7

MISCELLANEOUS TREATMENT: Removal of color, odor, taste, use of copper sulfate, adsorption technique, fluoridation and defluoridation.

4 Hours

DISTRIBUTION SYSTEMS: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

4
Hours

Unit - 8
MISCELLANEOUS: Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Layout of water supply pipes in buildings.
2
Hours

TEXT BOOKS:
1. Water supply Engineering –S.K.Garg, Khanna Publishers
2. Environmental Engineering I –B C Punima and Ashok Jain
3. Manual on Water supply and treatment –CPHEEO, Minstry of Urban Development, New Delhi

REFERENCES

1. Hammer, M.J., (1986), **Water and Wastewater Technology** –SI Version, 2nd
Edition, John Wiley and Sons.

2. Karia, G.L., and Christian, R.A., (2006), **Wastewater Treatment – Concepts and Design Approach,** Prentice Hall of India Pvt. Ltd., New Delhi.

3. Metcalf and Eddy, (2003), **Wastewater Engineering, Treatment and Reuse ,** 4th Edition, Tata McGraw Hill Edition, Tata McGraw Hill Publishing Co. Ltd.

4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986),**Environmental Engineering**–Mc Graw Hill Book Co.

5. Raju, B.S.N., (1995), **Water Supply and Wastewater Engineering, T**ata McGraw Hill Pvt. Ltd., New Delhi.

6. Sincero, A.P., and Sincero, G.A., (1999), **Environmental Engineering – A Design Approach**–Prentice Hall of India Pvt. Ltd., New Delhi.

DESIGN & DRAWING OF RC STRUCTURES

Subject Code	**: 10CV62**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) +03 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

UNIT-1
Layout Drawing: General layout of building showing, position of columns, footings, beams and slabs with standard notations.
UNIT-2
Detailing of Beam and Slab floor system, continuous beams.
UNIT-3
Detailing of Staircases: Dog legged and Open well.
UNIT-4
Detailing of Column footings: Column and footing (Square and Rectangle).

13 (T) + 18 (D)

PART - B

UNIT-5
Design and detailing of Rectangular Combined footing slab and beam type.
UNIT-6
Design and detailing of Retaining walls (Cantilever and counter fort type).
UNIT-7
Design and detailing of Circular and Rectangular water tanks resting on ground and free at top(Flexible base and Rigid base), using IS: 3370 (Part IV) only.
UN IT-8
Design and detailing of Simple Portal Frames subjected to gravity loads.(Single bay & Single storey)

13 (T) + 21 (D)

REFERENCE BOOKS:

1. **Structural Design & Drawing Reinforced Concrete & Steel**- N. Krishnaraju, University Press.

2. **Structural Design and Drawing**- Krishnamurthy -, (Concrete Structures), CBS publishers, New Delhi. Tata Mc-Graw publishers.
3. **Reinforced Concrete Structures** - B.C. Punmia – Laxmi Publishing Co.
4. **Reinforced Concrete Design –** S.N.Sinha, McGrawHill Education,

SCHEME OF QUESTION PAPER:
Part A : Three questions each carrying 20 marks is to be set. Student has to answer two questions out of three.
Part B: Two questions each carrying 60 marks is to be set. Student has to answer one question out of two.

TRANSPORTATION ENGINEERING II

Subject Code : 10CV63
I A Marks :25
No. of lecture Hours/week :04
Exam Hours :03
Total No. of Lecture Hours :52
Exam Marks :100

PART – A
RAILWAY ENGINEERING

UNIT – 1
INTRODUCTION: Role of railways in transportation, Indian Railways, Selection of Routes, Permanentway and its requirements, Gauges and types, Typical cross sections-single and double line B G track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails, **Rails**-Functions-requirements—types and sections-length-defects-wear-creep-welding-joints, creep of rails

06 Hrs

UNIT – 2
SLEEPERS AND BALLAST: Functions, requirements, Types, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip,-Fish plates-bearing plates, Calculation of quantity of materials required for laying a track-Examples, **Tractive resistances** and hauling capacity with examples

06Hrs

UNIT – 3

GEOMETRIC DESIGN: Necessity, Safe speed on curves, **Cant**-cant deficiency-negetive cant-safe speed based on various criteria,(both for normal and high speed tracks) Transition curve, Gradient and types, grade compensation, Examples on above.

06 Hrs

UNIT – 4

POINTS AND CROSSING: Components of a turnout, Details of Points and Crossing, Design of turnouts with examples (No derivations) types of switches, crossings, track junctions Stations and Types, Types of yards, Signalling-Objects and types of signals, station and yard Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.

08 Hrs

PART – B

AIRPORT ENGINEERING

UNIT – 5

INTRODUCTION: Layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples

06 Hrs

UNIT – 6

RUNWAY- Basic runway length-Corrections and examples, Runway geometrics, **Taxiway**-Factors affecting the layout - geometrics of taxiway-Design of exit taxiway with examples, **Visual aids-** Airport marking – lighting-Instrumental Landing System.

06 Hrs

TUNNEL ENGINEERING

UNIT – 7

TUNNELS: Advantages and disadvantages, Size and shape of tunnels, Surveying-Transferring centre line, and gradient from surface to inside the tunnel working face, Weisbach triangle-Examples, Tunnelling in rocks-methods, Tunnelling methods in soils-Needle beam, Liner plate, Tunnel lining, Tunnel ventilation, vertical shafts, Pilot tunneling, mucking and methods, drilling and drilling pattern.

06Hrs

UNIT – 8

HARBOURS: Harbour classifications, Layout with components, Natural phenomenon affecting the design of harbours - wind, wave and tide, currents, Breakwater-Types Wharf and Quays, Jetties and Piers, Dry dock and wet docks, Slipways, Navigational aids, warehouse and transit-shed.

08 Hrs

TEXT BOOKS

1. **Railway Engineering -** Saxena and Arora, Dhanpat Rai & Sons, New Delhi
2. **Indian Railway Track –** M M Agarwal, Jaico Publications, Bombay
3. **Airport Planning and Design –** Khanna Arora and Jain, Nem Chand Bros, Roorkee
4. **Doks and Tunnel Engineering –** R Srinivasan, Charaotar Publishing House
5. **Docks and Harbour Engineering –**H P Oza and G H Oza Charaotar Publishing House
6. **Surveying –** B C Punmia, Laxmi Publications

REFERENCE BOOK

1. **Railway Engineering – Mundrey, McGraw Hill Publications**

GEOTECHNICAL ENGINEERING – II

Subject Code	**: 10CV64**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

SUBSURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, Seismic refraction method of grophysical exploration, Types of samples - undisturbed, disturbed and representative samples, Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro- Osmosis method.

8 Hours

UNIT - 2

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart.

6 Hours

UNIT - 3

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter.

5 Hours

UNIT - 4

LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

7 Hours

PART - B

UNIT - 5

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, Taylor's stability number, Fellineous method,.

7 Hours

UNIT - 6

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test.

8 Hours

UNIT - 7

FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (no derivations, but, computation using relevant formula for Normally Consolidated soils), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hours

UNIT – 8

PROPORTIONING SHALLOW AND PILE FOUNDATIONS

Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity, Proportioning pile foundation.

6 Hours

TEXT BOOKS:

1. **Soil Engineering in Theory and Practice**- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.

REFERENCES BOOKS:

1. **Foundation Analysis and Design**- Bowles J.E. (1996), 5th Edition, McGraw Hill Pub. Co. New York.

2. **Soil Mechanics and Foundation Engineering**- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. **Basic and Applied Soil Mechanics**- Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., Newe Delhi.
4. **Geotechnical Engineering**- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., Newe Delhi.
5. **Soil Mechanics**- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. **Principles of Geotechnical Engineering**- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. **Text Book of Geotechnical Engineering**- Iqbal H. Khan (2005), 2nd Edition, PHI, India.

HYDRAULIC STRUCTURES & IRRIGATION DESIGN-DRAWING

Subject Code	**: 10CV65**	IA Marks	: 25
No. of Lecture Hours/Week	: 02+03	Exam Hours	: 04
Total No. of Lecture Hours	: 25+40	Exam Marks	: 100

PART-A
Hydraulic Structures

Unit1: Reservoir Planning

Introduction, classification of Reservoirs, Storage zones of a reservoir, Mass curve, fixing capacity of a reservoir, safe yield, problems, density currents, Trap efficiency, Reservoir sedimentation, life of a reservoir, economic height of a dam, problems. environmental effects of reservoirs, **6 hours**

Unit2: Gravity Dams

Introduction, forces on a gravity dam, stress analysis in gravity dam, Problems, combination of forces for design. Elementary & practical profiles of a gravity dam, stability analysis (without earth quake forces), problems, galleries in gravity dams,

7 hours

Unit3: Earth Dams

Introduction, types of Earth dams, construction methods, Design criteria for Earth dams, causes of failure of earth dams, section of dam, preliminary design criteria, problems, control of seepage through earth dams, Safety measures.

6 hours

Unit4: Spillways

Introduction, essentials of a spillway, spillway components, factors affecting type & design of spillways. Ogee spillway (simple design problems). Energy dissipation below spillways (hydraulic jump- No design). **6 hours**

PART-B

Irrigation Design- Drawing

Design and Drawing with all the three views of :

1. Surplus weir with stepped apron
2. Tank Plug sluice without tower head
3. Canal gate sluice without tower head
4. Notch type Canal Drop
5. Canal Cross regulator.
6. Aqeduct (Hydraulic Design only)

40 hours

Text Books:

1. Text book of irrigation engineering & Hydraulic Structures- R.K.Sharma, Oxford & IBH publishing Co., New Delhi (2002)
2. Irrigation & Water resources engineering- G.L.Asawa, New Age International Publishers, New Delhi (2005)
3. Irrigation, Water Resources & Water power engineering- Modi . P.N., Standard Book House, New Delhi
4. Design of minor irrigation and Canal structures- C. Sathya Narayana Murthy, Wiley eastern limited, New Delhi (1990)

Reference Books:

1. Irrigation engineering & Hydraulic structures- Garg.S.K., khanna publishers, New Delhi
2. Hydraulic Structures & Irrigation Design Drawing - Dr.N.Balasubramanya, Tata Mcgraw-Hill Education Pvt.Ltd., New Delhi
3. irrigation and Water Power Engineering- Madan Mohan Das & Mimi Das Saikia, PHI Learning Pvt. Ltd., New Delhi (2009)

Question paper pattern:

Four questions are to be set from Part A of which **Two** full questions are to be answered for 40 marks

Two questions are to be set from Part B of which **one** full question is to be answered for 60 marks (25 marks for design + 35 marks for two views)

THEORY OF ELASTICITY

Subject Code	**: 10CV661**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT -1

Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, Generalised Hooke's Law, Strain- displacement relations, St. Venant's principle

5 Hours

UNIT - 2

Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials – for Two Dimensional cases only.

8 Hours

UNIT- 3

Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, Mohr's circle of stress and strain, analytical method.

4 Hours

UNIT - 4

Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, Simply supported beam subjected to UDL.

10 Hours

PART - B

UNIT - 5
Two-dimensional problems in polar coordinates, strain-displacement relations, equations of equilibrium, compatibility equation, stress function.

8 Hours

UNIT - 6
Axi Symmetric stress distribution - Rotating discs, Lame's equation for thick cylinder.

5 Hours

UNIT- 7
Effect of circular hole on stress distribution in plates subjected to tension, compression and shear, stress concentration factor.

7 Hours

UNIT - 8
Torsion: Inverse and Semi-inverse methods, stress function, torsion of circular and elliptical sections.

5 Hours

TEXT BOOKS:

1. **"Theory of Elasticity" - International Students**- Timoshenko. S.P. and Goodier. J.N. - Edition, McGraw Hill Book Co. Inc., New Delhi.
2. **Applied Elasticity**- Wang. P.C.

REFERENCE BOOKS:

1. **Contiuum Mechanics Fundamentals**- Valliappan. C : Oxford and IBH Publishing Co. Ltd., New Delhi.
2. **Advanced Mechanics of Solids**- Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.
3. **Structural Mechanics with Introduction to Elastity and Plasticity**- Venkataraman and Patel : McGraw Hill Book Inc., New York.
4. **Mechanics of Solids**- Arbind Kumar Singh : Prentice hall of India Pvt. Ltd. New Delhi -2007.

ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES

Subject Code	**: 10CV662**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION:

1. Energy in building materials
2. Environmental issues concerned to building materials
3. Global warming and construction industry
4. Environmental friendly and cost effective building technologies.
5. Requirements for building of different climatic regions.
6. Traditional building methods and vernacular architecture.

6 Hours

UNIT - 2
ALTERNATIVE BUILDING MATERIALS:

1. Characteristics of building blocks for walls
2. Stones and Laterite blocks
3. Bricks and hollow clay blocks
4. Concrete blocks
5. Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block

6 Hours

UNIT - 3
LIME-POZZOLANA CEMENTS

1. Raw materials
2. Manufacturing process
3. Properties and uses
4. Fibre reinforced concretes
5. Matrix materials
6. Fibers : metal and synthetic
7. Properties and applications
8. Fibre reinforced plastics
9. Matrix materials
10. Fibers : organic and synthetic
11. Properties and applications
12. Building materials from agro and industrial wastes
13. Types of agro wastes

14. Types of industrial and mine wastes
15. Properties and applications
16. Field quality control test methods

6 Hours

UNIT - 4
ALTERNATIVE BUILDING TECHNOLOGIES

1. Alternative for wall construction
2. Types
3. Construction method
4. Masonry mortars
5. Types
6. Preparation
7. Properties
8. Ferrocement and ferroconcrete building components
9. Materials and specifications
10. Properties
11. Construction methods
12. Applications
13. Alternative roofing systems
14. Concepts
15. Filler slabs
16. Composite beam panel roofs
17. Masonry vaults and domes

8 ours

PART - B

UNIT - 5
STRUCTURAL MASONRY

1. Compressive strength of masonry elements
2. Factors affecting compressive strength
3. Strength of units, prisms / wallettes and walls
4. Effect of brick work bond on strength
5. Bond strength of masonry : Flexure and shear
6. Elastic properties of masonry materials and masonry

6 Hours

UNIT - 6

1. IS Code provisions
2. Design of masonry compression elements
3. Concepts in lateral load resistance

8 Hours

UNIT - 7
COST EFFECTIVE BUILDING DESIGN

1. Cost concepts in buildings
2. Cost saving techniques in planning, design and construction
3. Cost Analysis : Case studies using alternatives.

6 Hours

UNIT - 8
EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS

1. Machines for manufacture of concrete
2. Equipments for production of stabilized blocks
3. Moulds and methods of production of precast elements.

6 Hours

TEXT BOOKS:

1. **Alternative building methodologies for engineers and architects, lecture notes edited**: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of cience, Bangalore.
2. **Structural Masonry** by Arnold W. Hendry.

REFERENCE BOOKS:

1. **Relevant IS Codes.**
2. **Alternative building materials and technologies.**
3. **Proceedings of workshop on Alternative building material and technology,** 19th to 20th December 2003 @ BVB College of Engineering. & Tech., Hubli.

GROUND IMPROVEMENT TECHNIQUES

Subject Code	**: 10CV663**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

GROUND IMPROVEMENT: Definition, Objectives of ground improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Ground modification for Black Cotton soil

4 Hours

UNIT - 2

COMPACTION: Effect of grain size distribution on compaction for various soil types like lateritic soil, coarse-grained soil and micaceous soil. Effect of compaction on engineering behaviour like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. Shallow and deep compaction, Dynamic Compaction, Vibrofloatation.

8 Hours

UNIT - 3

HYDRAULIC MODIFICATION: Definition, Principle and techniques. gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering.

6 Hours

UNIT - 4

DRAINAGE & PRELOADING: Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.

6 Hours

PART - B

UNIT - 5
CHEMICAL MODIFICATION-I: Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash.

6 Hours

UNIT - 6
CHEMICAL MODIFICATION-II: Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

6 Hours

UNIT - 7
GROUTING: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.

6 Hours

UNIT - 8
MISCELLANEOUS METHODS (ONLY CONCEPTS & USES): Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micropiles.

8 Hours

TEXT BOOKS:

1. **Ground Improvement Techniques**- Purushothama Raj P. (1999) Laxmi Publications, New Delhi.
2. **Construction and Geotechnical Method in Foundation Engineering**- Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

REFERENCE BOOKS:

1. **Engineering principles of ground modification**- Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.

2. **Methods of treatment of unstable ground**- Bell, F.G. (1975) Butterworths, London.
3. **Expansive soils**- Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. **Soil Stabilization; Principles and Practice**- Ingles. C.G. and Metcalf J.B. (1972) - Butterworths, London.

ADVANCED SURVEYING

Subject Code	**:10CV664**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT: Errors and classification of errors Precision and accuracy, Laws of weights and accidental errors.

5 Hours

UNIT - 2

PROBABILITY: Probability distribution function and density function-normal distribution. RMS error-measure of precision. Rejection of observations-principles of least squares-Normal equations.

6 Hours

UNIT - 3

METHOD OF CORRELATES: Triangulation adjustment. Angle adjustment, station adjustment and figure adjustment.

6 Hours

UNIT - 4

ELECTRONIC DISTANCE MEASUREMENT (EDM): Introduction, Electro Magnetic (EM) Waves. Phase comparison and modulations. Instruments – Geodimeter – Tellurimeter – Distomat – Range finders – Radars. Introduction to GPS Total station.

8 Hours

PART - B

UNIT - 5

FIELD ASTRONOMY: Earth celestial sphere. Solar system Position by altitude and azimuth system-spherical triangle and spherical trigonometry. Astronomical triangle. Nepiers rule.

8 Hours

UNIT - 6

TIME: Siderial time, day and year-solar time and day-Greenwich mean time-standard time. Meridian and azimuth-their determination-latitude and its determination.

6 Hours

UNIT - 7

HYDROGRAPHIC SURVEYING: Methods of soundings. Instruments. Three point problem. Tidal and Stream discharge measurem

7 Hours

UNIT - 8

SETTING OUT WORKS: Introduction. Setting out of buildings, culverts, bridge, pipeline and sewers, tunnels.

6 Hours

TEXT BOOKS:

1. **Surveying Vol I, II & III**- Punmia. B.C. - Lakshmi Publications, New Delhi.
2. **Surveying Vol I & II**- Duggal S.K. - Tata Mc Graw-Hill publishing Co.,
3. **Surveying Levelling-Part I & II** – Kanitkar T.P. & Kulkarni S.V. – Pune Vidhyarthi Gruha Prakashana.

REFERENCE BOOKS:

1. **Introduction to Surveying**- James, M. Anderson and Edward, M. Mikhail – Mc Graw Hill Book Co., 1985.
2. **Analysis and survey measurements**- M. Mikhalil and Gracie, G. - Van Nostrand Reinhold Co., (NY)-1980.
3. **Plane and Geodetic Surveying for Engineers -** David Clark -Vol I & II-**CBS** publishers and distributors, New Delhi.

GROUND WATER HYDROLOGY

Subject Code	**: 10CV665**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Importance. Vertical distribution of sub-surface water. Occurrence in different types of rocks and soils. Definition of aquifer, Aquifuge, Aquitard and Aquiclude. Confined and unconfined aquifers.

6 Hours

UNIT - 2
AQUIFER PROPERTIES: Aquifer parameters – Specific yield, Specific retention, Porosity, Storage coefficient, derivation of the expression. Determination of specific yield. Land subsidence due to ground water withdrawals.

6 Hours

UNIT - 3
DARCY'S LAW AND HYDRAULIC CONDUCTIVITY: Introduction. Darcy's law. Hydraulic conductivity. Coefficient of permeability and Intrinsic permeability, Transmissibility, Permeability in Isotropic, Unisotropic layered soils. Steady one dimensional flow, different cases with recharge.

7 Hours

UNIT - 4
WELL HYDRAULICS – STEADY FLOW: Introduction. Steady radial flow in confined and unconfined aquifers. Pumping tests.

7 Hours

PART - B

UNIT - 5
WELL HYDRAULICS – UNSTEADY FLOW: Introduction. General equation derivation; Theis method, Cooper and JaCob method, Chow's method. Solution of unsteady flow equations.

7 Hours

UNIT - 6

GROUND WATER DEVELOPMENT: Types of wells. Methods of constructions. Tube well design. Dug wells. Pumps for lifting water: Working principles, Power requirements.

7 Hours

UNIT - 7

GROUND WATER EXPLORATION: Seismic method, Electrical resistivity method, Bore hole geo-physical techniques; Electrical logging, Radio active logging, Induction logging, Sonic logging and Fluid logging.

6 Hours

UNIT - 8

GROUND WATER RECHARGE AND RUNOFF: Recharge by vertical leakage. Artificial recharge. Ground water runoff. Ground water budget.

6 Hours

TEXT BOOKS:

1. **Ground Water**- H.M. Raghunath, - Wiley Eastern Limited, New Delhi.
2. **Ground Water Hydrology**- K. Todd, - Wiley and Sons, New Delhi.
3. **Numerical Ground Water Hydrology**- A.K. Rastogi, - Penram, International Publishing (India), Pvt. Ltd., Mumbai.

REFERENCE BOOKS:

1. **Ground Water Hydrology**- Bower H.- McGraw Hill, New Delhi.
2. **Ground Water and Tube Wells**- Garg Satya Prakash, - Oxford and IBH, New Delhi.
3. **Ground Water Resource Evaluation**- W.C. Walton, - McGraw Hill - Kogakusha Ltd., New Delhi.
4. **Water wells and Pumps** – Michel D.M., Khepar. S.D., Sondhi. S.K., McGraw Hill Education – 2nd Edition.

RURAL WATER SUPPLY AND SANITATION

Subject Code	:10CV666	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part - A

UNIT - 1

RURAL WATER SUPPLY: Introduction: Need for a protected water supply, investigation and selection of water sources, water borne diseases, protection of well water, drinking water quality standards.

6 Hours

UNIT - 2

Types of pumps, supply systems viz., BWS MWS, PWS, water treatment methods – disinfection, deflouridation, hardness and iron removal, ground water contamination and control.

6 Hours

UNIT - 3

RURAL SANITATION: public latrine, concept of Eco-sanitation, trenching and composting methods, Two pit latrines, aqua privy, W.C, septic tank, soak pit.

8 Hours

UNIT - 4

DRAINAGE SYSTEMS: Storm water and sullage disposal, rain water harvesting and uses.

3 Hours

Part - B

UNIT - 5

COMMUNICABLE DISEASES: Terminology, classifications, methods of communication, general methods of control.

4 Hours

UNIT - 6

REFUSE COLLECTION AND DISPOSAL: collection methods, transportation, disposal – salvaging, dumping, manure pits, dumping in low lands , composting, dung disposal – digester, biogas plant.
10 Hours

UNIT - 7
MILK SANITATION: Essentials, test for milk quality, pasteurization, quality control, cattle borne diseases, planning for a cow shed.
9 Hours

UNIT - 8
INSECT CONTROL: House fly and mosquito – life cycle, diseases, transmission and control measures.
6 Hours

TEXT BOOKS:
1. Environmental Sanitation - Joseph. A. Solveto
2. Water Supply & Sanitary Engineering - E.W.Steel

REFERENCE BOOK:
1. Preventive & Social Medicine - Park & Park

TRAFFIC ENGINEERING

Subject Code	**: 10CV667**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.
2 Hours

UNIT - 2
TRAFFIC CHARACTERISTICS: Road user characteristics, vehicular characteristics – static and dynamic characteristics, power

performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

6 Hours

UNIT - 3

TRAFFIC STUDIES: Various types of traffic engineering studies, data collection, analysis objectives and method of study – Definition of study area – Sample size and analysis.

6 Hours

UNIT - 4

INTERPRETATION OF TRAFFIC STUDIES: Classified traffic Volume at mid block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking, off street parking, Accident – causes, analysis measures to reduce accident – problems on above.

6 Hours

PART - B

UNIT - 5

TRAFFIC FLOW THEORIES: Traffic flow theory, Green shield theory – Goodness of fit, - correlation and regression analysis (linear only) – Queuing theory, Car following theory and relevant problems on above.

8 Hours

UNIT - 6

STATISTICAL ANALYSIS: Poisson's distribution and application to traffic engineering. Normal Distribution – Significance tests for observed traffic data, Chi Square test – problems on above. Traffic forecast – simulation technique.

12 Hours

UNIT - 7

TRAFFIC REGULATION AND CONTROL: Driver, vehicle and road controls – Traffic regulations – one way – Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

10 Hours

UNIT - 8
INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario

2 Hours

TEXT BOOKS:

1. **Traffic Engineering & Transport Planning** – L.R. Kadiyali- Khanna Publishers.
2. **Highway Engineering Nemchand & Bros**- Khanna & Justo- Roorkee (UA).
3. **Traffic Engg.** - Matson & Smith:-Mc.Graw Hill and Co.
4. **Traffic flow theory** – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. **Traffic Engineering.** Pignataro- Prentice Hall.
2. **Highway Capacity Manual** – 2000.
3. **An introduction to traffic engineering**- Jotin Khistey and Kentlal- PHI.
4. **Traffic Engineering**- Mc Shane & Roess- PHI.

GEOTECHNICAL ENGINEERING LABORATORY

Subject Code	**: 10CVL67**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Identification of gravel type, sand type, silt type and clay types soils, Tests for determination of Specific gravity (for coarse and fine grained soils) and Water content (Oven drying method). **3 Hours**

2. Grain size analysis of soil sample (sieve analysis). **3 Hours**

3. In situ density by core cutter and sand replacement methods. **3 Hours**

4. Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.

3 Hours

5. Standard Proctor Compaction Test and Modified Proctor Compaction Test.

3 Hours

6. Coefficient of permeability by constant head and variable head methods.

3 Hours

7. Strength Tests
    a. Unconfined Compression Test **3 Hours**
    b. Direct Shear Test **3 Hours**
    c. Triaxial Compression Test (undrained) **3 Hours**

8. Consolidation Test- Determination of compression index and coefficient of consolidation.

3 Hours

9. Laboratory vane shear test **3 Hours**

10. Determination of CBR value **3 Hours**

11. a) Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle.
    b) Demonstration of Hydrometer Test.
    c) Demonstration of Free Swell Index and Swell Pressure Test
    d) Demonstration of determination of relative density of sands.

3 Hours

12. Preparing a consolidated report of index properties and strength properties of soil

3 Hours

REFERENCE BOOKS:

1. **Soil Mechanics and Foundation Engg.**- Punmia B.C. (2005), 16^{th} Edition Laxmi Publications Co. , New Delhi.
2. **BIS Codes of Practice**: IS 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.
3. **Mittal**
4. **Soil Testing for Engineers**- Lambe T.W., Wiley Eastern Ltd., New Delhi.
5. **Manual of Soil Laboratory Testing-** Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
6. **Engineering Properties of Soil and Their Measurements**- Bowles J.E. (1988), - McGraw Hill Book Co. New York.

EXTENSIVE SURVEY VIVA - VOCE

Subject Code	**: 10CVL68**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

(To be conducted between 5^{th} & 6^{th} Semester for a period of 2 weeks, Viva voce conducted along with 6^{th} semester exams)

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. **(Drawings should be done using AutoCAD)**

1. General instructions, Reconnaissance of the sites and fly leveling to establish bench marks.

2. **NEW TANK PROJECTS:** The work shall consist of
   i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.

ii) Capacity surveys.
iii) Details at Waste weir and sluice points.
iv) Canal alignment.
(At least one of the above new tank projects should be done by using TOTAL STATION)

3. **WATER SUPPLY AND SANITARY PROJECT:** Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

4. **HIGHWAY PROJECT:** Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road.

5. **OLD TANK PROJECTS:** The work shall consist of
   i) Alignment of center line of the existing bund, Longitudinal and cross sections of the centre line.
   ii) Capacity surveys to explore the quantity.
   iii) Details at existing Waste weir and sluice points.

VII SEMESTER
ENVIRONMENTAL ENGINEERING – II

Subject Code	**: 10CV71**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Necessity for sanitation, methods of domestic waste water disposal, types of sewerage systems and their suitability.

Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain. Time of concentration.

6 Hours

UNIT - 2
DESIGN OF SEWERS: Hydraulic formulae for velocity, effects of flow variations on velocity, self cleansing and non scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full (No derivations).
MATERIALS OF SEWERS: Sewer materials, shapes of sewers, laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers.

6 Hours

UNIT - 3
SEWER APPURTENANCES: Catch basins, manholes, flushing tanks, oil and grease traps, Drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage.

6 Hours

UNIT - 4
WASTE WATER CHARACTERIZATION: Sampling, significance, techniques and frequency. Physical, Chemical and Biological characteristics, Aerobic and Anaerobic activity, CNS cycles. BOD and COD. Their significance & problems

06 Hours

PART – B

UNIT - 5
DISPOSAL OF EFFLUENTS : Disposal of Effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Effluent Disposal standards for land, surface water

& ocean. Numerical Problems on Disposal of Effluents. Streeter Phelps equation.

6 Hours

UNIT - 6

TREATMENT OF WASTE WATER: Flow diagram of municipal waste water treatment plant. Preliminary & Primary treatment **:** Screening, grit chambers, skimming tanks, primary sedimentation tanks – Design criteria & Design examples.

6 Hours

UNIT - 7

SECONDARY TREATMENT: Suspended growth and fixed film bioprocess. Trickling filter – theory and operation, types and designs. Activated sludge process- Principle and flow diagram, Modifications of ASP, F/M ratio. Design of ASP.

8 Hours

UNIT - 8

Anaerobic Sludge digestion, Sludge digestion tanks, Design of Sludge drying beds. Low cost waste treatment method. Septic tank, Oxidation Pond and Oxidation ditches – Design. Reuse and recycle of waste water.

8 Hours

REFERENCES

1. **Manual on Waste Water Treatment** : CPHEEO, Ministry of Urban Development, New Delhi.
2. **Water and Wastewater Engineering Vol-II** :- Fair, Geyer and Okun : John Willey Publishers, New York.
3. **Waste Water Treatment, Disposal and Reuse** : Metcalf and Eddy inc : Tata McGraw Hill Publications.
4. **Water Technology**.- Hammer and Hammer
5. **Environmental Engineering**: Howard S. Peavy, Donald R. Rowe, George Tchnobanoglous McGraw Hill International Edition.

DESIGN OF STEEL STRUCTURES

Subject Code	**: 10CV72**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART-A

UNIT-1

INTRODUCTION: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification. **6 Hours**

UNIT-2

BOLTED CONNECTIONS: Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Pin Connections, Simple Connections, Moment resistant connections, Beam to Beam connections, Beam and Column splices, Semi rigid connections 6 **Hours**

UNIT-3

WELDED CONNECTIONS: Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections, Continuous Beam to Column connections, Continuous Beam to Beam connections, Beam Column splices, Tubular connections

6 **Hours**

UNIT-4

Plastic Behaviour of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams. **7 Hours**

PART-B

UNIT-5

Design of Tension Members: Introduction, Types of tension members, Design of strands, Slenderness ratio, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, Other sections, Design of tension member, Lug angles, Splices, Gussets.

6 Hours

UNIT-6

Design of Compression Members: Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built up compression members.

8 Hours

UNIT-7

Design of Column Bases:, Design of simple slab base and gusseted base

6 Hours

UNIT-8

Design of Beams: Introduction, Beam types, , Lateral stability of beams, factors affecting lateral stability, Behaviour of simple and built-up beams in bending(without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams and purlins

7 Hours

Note: Study of this course should be based on **IS: 800-2007**

Reference Books

1) Design of Steel Structures, N.Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures. Duggal. TATA Megra Hill 2010
3) Bureau of Indian Standards, IS800-2007, IS875-1987
4) Steel Tables

ESTIMATION & VALUATION

Subject Code	**: 10CV73**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components.

16 Hours

PART - B

ESTIMATE: Different type of estimates, approximate methods of estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators.

5 Hours

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts.

6 Hours

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

5 Hours

PART - C

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

6 Hours

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.

6 Hours

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

Valuation- Definitions of various terms, method of valuation, Freehold & Leasehold properties, Sinking fund, depreciation and method of estimating depreciation, Outgoings.

8 Hours

REFERENCE BOOKS:

1. **Estimating & Costing**, B. N. Dutta, Chand Publisher
2. **Quantity Surveying**- P.L. Basin S. Chand : New Delhi.
3. **Estimating & Specification** - S.C. Rangwala :: Charotar publishing house, Anand.
4. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons : New Delhi.
5. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
6. **Contracts and Estimates,** B. S. Patil, University Press, 2006.

DESIGN OF PRE-STRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV74**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties.

2 Hours

BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.

4 Hours

UNIT - 2
ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.

8 Hours

UNIT - 3
LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.

6 Hours

UNIT - 4
DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection

6 Hours

PART - B

UNIT - 5
LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.

5 Hours

UNIT - 6
LIMIT STATE OF COLLAPSE (cont…): Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.

7 Hours

UNIT - 7
DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.

6 Hours

UNIT - 8
DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile.

8 Hours

REFERENCE BOOKS:

1. **Pre-stressed Concrete**- N. Krishna Raju - Tata Mc. Graw Publishers.
2. **Pre-stressed Concrete**- P. Dayarathnam : Oxford and IBH Publishing Co.

3. **Design of pre-stressed concrete structures**- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. **Fundamental of pre-stressed concrete**- N.C. Sinha & S.K. Roy
5. IS : 1343 : 1980
6. **Pre-stressed Concrete**- N. Rajgopalan

MATRIX METHODS OF STRUCTURAL ANALYSIS

Subject Code	**: 10CV751**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
Introduction to flexibility method, Element flexibility matrix, Principle of contragradience, and Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces.

6 Hours

UNIT - 2
Analysis of axially rigid continuous beams by flexibility method using Force Transformation Matrix

6 Hours

UNIT - 3
Analysis of rigid plane frames with axially rigid members by flexibility method using Force Transformation Matrix.

6 Hours

UNIT - 4
Analysis of trusses by flexibility method Using Force Transformation Matrix.

6 Hours

PART - B

UNIT - 5
Fundamentals of the stiffness method, equivalent joint loads, DisplacementTransformation matrix. Member stiffness matrix, Total or System stiffness matrix, Truss analysis by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 6
Continuous Beam and rigid frame analysis with axially rigid members by stiffness method using Displacement Transformation Matrix.

8 Hours

UNIT - 7
Introduction to direct stiffness method, Local and global co-ordinate system, Transformation Of variables, Transformation of the member displacement matrix, Transformation of the member Force matrix, Transformation of the

member stiffness matrix, Transformation of the stiffness Matrix of the member of a truss, Transformation of the stiffness matrix of the member of the Rigid frame, Overall stiffness matrix, Boundary conditions, Computation of internal forces.

4 Hours

UNIT - 8

Analysis of trusses and continuous beams by direct stiffness method.

8 Hours

REFERENCE BOOKS:

1. **Matrix, finite elements, Computer and Structural analysis**- M Mukhopadhyay - Oxford &IBW,1984
2. **Matrix Analysis of framed structures**- W. Weaver J.M. Gere - CBS publishers and Disributers,1986
3. **Computational structural Mechanics**- S Rajshekharan. G Sankara Subramanian - PHI, 2001
4. **Structural Analysis A Matrix Approach**- G.S Pandit & S P Gupta Tata Mc Graw-Hill, 1981
5. **Basic structural Analysis**- C.S Reddy - Tata Mc Graw-Hill, 1996
6. **Structural Analysis**- L S Negi and R S Jangid - Tata Mc Graw-Hill, 1997
7. **Introduction to Matrix Methods of Structural analysis -** H C Martin -International text book Company, 1996

ADVANCED DESIGN OF RC STRUCTURES

Subject Code	**: 10CV752**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Design of RCC overhead circular and rectangular water tanks with supporting towers.

8 Hours

UNIT - 2

Design of silos, bunkers using Janssen's Theory and Airy's Theory.

7 Hours

UNIT - 3

Design of RCC Chimneys.

6 Hours

UNIT - 4

Introduction to shell and folded plate roofs, their forms and structural behaviour. Design of simple cylindrical shell roof by beam theory.

6 Hours

PART - B

UNIT - 5

Yield line analysis of slabs by virtual work.

7Hours

UNIT - 6

Yield line analysis by equilibrium methods.

6 Hours

UNIT - 7

Design of Grid Floors Slabs by approximate method.

6 Hours

UNIT-8

Design of flat slabs by Direct Designer Method (with and without drops)

6 Hours

REFERENCE BOOKS:

1. **Reinforced Concrete Structures, Vol-II**- B C Punmia : Laxmi Publications (P) Ltd, New Delhi.
2. **Limit State Design of Reinforced Concrete Vol-II**- P C Varghese: Prentice Hall of India (P) Ltd, New Delhi.
3. **Plain and Reinforced Concrete – Vol-II**- Jai Krishna and Jain,: Nem Chand Bros, Roorkee.
4. **Analysis of Structures- Vol-II** : Vazirani V N & M M Ratwani : Khanna Publishers, New Delhi.
5. **Design Construction of Concrete Shell Roofs** : Ramaswamy G S : CBS Publishers and Distributors, new Delhi.
6. **Advanced Structural Design**- Bensen C
7. IS 456 – 2000 IS 3370 – 1967 (Part I, II and IS 1893)
8. **Advanced RCC Design- Vol-II**,- S. S. Bhavikatti New Age International Publication, New Delhi.

DESIGN OF MASONRY STRUCTURES

Subject Code	**: 10CV753**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

MASONRY UNITS, MATERIALS, TYPES & MASONRY CONSTRUCTION: Brick, stone and block masonry units – strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks.

6 Hours

UNIT - 2

STRENGTH AND STABILITY: Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression.

6 Hours

UNIT - 3

PERMISSIBLE STRESSES: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.

6 Hours

UNIT - 4

DESIGN CONSIDERATIONS: Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels.

8 Hours

PART - B

UNIT - 5

LOAD CONSIDERATIONS FOR MASONRY: Wall carrying axial load, eccentric load with different eccentricity ratios, walls with openings, free standing wall.

6 Hours

UNIT - 6

DESIGN OF MASONRY WALLS: Design of load bearing masonry for building up to 3 storeys using IS : 1905 and SP : 20 procedure.

10 Hours

UNIT - 7

REINFORCED MASONRY: Application, flexural and compression elements, shear walls.

5 Hours

UNIT - 8

MASONRY WALLS IN COMPOSITE ACTION: Composite wall-beam elements, infilled frames.

5 Hours

TEXT BOOKS:

1. **Structural Masonry**- Henry, A.W. : Macmillan Education Ltd., 1990.
2. **Brick and Reinforced Brick Structures**- Dayaratnam P. : Oxford & IBH, 1987.

REFERENCE BOOKS:

1. **Design of masonry structures**- Sinha B.P. Davies S.R. : E&FN spon 1997
2. IS 1905–1987 “Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi.
3. SP 20 (S&T) – 1991, “Hand book on masonry design and construction (1st revision) BIS, New Delhi.

EARTH & EARTH RETAINING STRUCTURES

Subject Code	**: 10CV754**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

EARTH DAMS AND EMBANKMENTS - Different types of earthen dams with sketches and their suitability. Hydraulic fill and rolled fill methods of construction – Causes of failure of earth dam – Design criteria of earth dams – Stability analysis of earthen dams – Seepage control in earthen dams. Role of Filters in Earth Dam Design.

7 Hours

UNIT - 2

RETAINING WALLS: Types of retaining walls, failure of retaining walls by sliding, overturning and bearing. Stability analysis and Principles of the design of retaining walls – Gravity retaining walls, Cantilever retaining walls, Counterfort retaining walls (no structural design) – Modes of failure of retaining walls – Drainage from the backfill.

7 Hours

UNIT - 3

BULK HEADS: Cantilever sheet pile walls Types of sheet pile walls – Free cantilever sheet pile - cantilever sheet pile in cohesion-less soils – cantilever sheet pile in clay.

6 Hours

UNIT - 4

BULK HEADS: Anchored Sheet Pile Walls: Anchored sheet pile with free earth support in cohesion-less and cohesive soil. bulkheads with fixed earth support method – Types, locations and design of anchors.

6 Hours

PART - B

UNIT - 5

BRACED CUTS: Introduction, Lateral earth pressure on sheeting, Different types of sheeting and bracing systems – design of various components of bracings.

7 Hours

UNIT- 6

ROCK FILL DAMS: Introduction, Origin and usage of rock fill dams, types of rock fill dams, design of rock fill dams and construction of rock fill dams.

6 Hours

UNIT- 7

COFFER DAMS & CELLULAR COFFER DAMS I: Introduction – types of coffer dams - Design of cellular coffer dams on rock by Tennesse Valley Authority (TVA) method – safety against sliding, slipping, overturning, vertical shear and stability against bursting.

7 Hours

UNIT- 8

CELLULAR COFFER DAMS II: Design of cellular coffer dam on soil - safety against sliding, slipping, overturning, vertical shear and stability against bursting.

6 Hours

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engineering** : Dr. K.R. Arora : Pub : Standard Publishers & Distributors.
2. **Soil Mechanics and Foundation Engineering,** : S.K. Garg : Pub : Khanna Publishers.

REFERENCE BOOKS:

1. **Soil Mechanics and Foundation Engineering,**: Dr. B.C. Punmia : Pub : Laxmi Publications Ltd.,
2. **Foundation Engineering.**: Dr. B.J. Kasmalkar
3. **Numericals in Geotechnical Engineering** : A.V. Narasimha Rao & C. Venkataramaiah :Pub : University Press.
4. **Hydraulic Structures**: S.K. Garg : Pub : Khanna Publishers.

5. **Soil Mechanics and Foundation Engineering,** : Dr. V.N.S. Murthy : Pub : Sai Tech.
6. **Geotechnical Engineering,** : Dr. C. Venkataramaiah : Pub : New age publications.
7. **Geotechnical Engineering** : Purushotam Raj .
8. **Theory and Practice of Soil Engineering** : Alum Singh .
9. **Principles of Geotechnical Engineering, Das, B**. M., Cengage Learning, 2009

HIGHWAY GEOMETRIC DESIGN

Subject Code	**: 10CV755**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Geometric Control factors like Topography -design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – factors controlling PCU for different design purpose

6 Hours

UNIT - 2
CROSS SECTIONAL ELEMENTS: Pavement surface characteristics – friction – skid resistance – pavement unevenness - light reflecting characteristics – camber – objectives – types of camber – methods of providing cambers in the field – problems – carriage way – kerb – median – shoulder – foot path – parking lanes – service roads – cycle tracks – Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest I RC provisions.

10 Hours

UNIT - 3
SIGHT DISTANCE: Importants, types, Side distance at uncontrolled intersection, derivation, factors affecting side distance, IRC, AASHTO standards, problems on above.

6 Hours

UNIT - 4
HORIZONTAL ALIGNMENT: Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves – objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above

8 Hours

PART - B

UNIT - 5
VERTICAL ALIGNMENT: Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD – Night visibility considerations – Design standards for hilly roads – problems on the above.

5 Hours

UNIT - 6
INTERSECTION DESIGN: Principle – Atgrade and Grade separated junctions – Types – channelization – Features of channelising Island – median opening – Gap in median at junction.

6 Hours

UNIT - 7
ROTARY INTERSECTION: Elements – Advantages – Disadvantages – Design guide lines – problem on the above – Grade separated intersection – Three legged inter section – Diamond inter change – Half clover leaf – clover leaf- Advantages- Disadvantages only

6 Hours

UNIT - 8
HIGHWAY DRAINAGE: Importance – sub surface drainage –surface drainage – Design of road side drives – Hydrological – Hydraulical considerations and design of filter media, problems on above.

5 Hours

TEXT BOOKS:

1. **Principle and practice of Highway Engineering**- L R KADIYALI & N B LAL : Khanna publications
2. **Highway Engineering –** Khanna S K & Justo, Nemchand & Bros.
3. **Highway Engineering** by Srinivas Kumar.

REFERENCE BOOKS:

1. **Highway Engineering**- Kadiyali L R : Khanna publications
2. **Relavent IRC** Publications
3. **Transportation Engineering and Planning**- Papa Coastas and Prevendors PHI, New Delhi.

OPEN CHANNEL HYDRAULICS

Subject Code	**: 10CV756**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors.

8 Hours

UNIT - 2

UNIFORM FLOW: Concepts, uniform flow equations, conveyance and hydraulic exponent for uniform flow, design of channels for uniform flow.

8 Hours

UNIT - 3

CRITICAL FLOW: Concept of specific Energy – Classification of flow. Design of channel, Section Factor, Hydraulic exponent for critical flow critical depth as a flow measurement.

6 Hours

UNIT - 4

GRADUALLY VARIED FLOW: Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation, Characteristics of flow profile and classification.

6 Hours

PART - B

UNIT - 5

Analysis of flows profiles, Method of singular point and transitional depth, Methods of computation, Practical problems.

6 Hours

UNIT - 6

Gradually Varied Flow Computations: Different methods, direct integration method, Bress's Solution, Chow's solution, direct method, standard step method.

8 Hours

UNIT - 7

Rapidly Varied Flow: Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length location height, application of hydraulic jump stilling basins, shape type-2 and type-4.

6 Hours

UNIT - 8

Hydraulic jump in rectangular channels, Sloping channels, Jump in non rectangular channels, application of hydraulic jump as energy desipator

4 Hours

TEXTBOOKS:

1. **Open Channel Hydraulics** : Subramanya : Tata Mc Graw Hill Publishing Co Ltd, New Delhi
2. **Open Channel Flow –** Madan Mohan Das, Prentice Hall of India Pvt. Ltd., New Delhi 2008 Edition.

3. **Flow Through Open Channels –** Rajesh Srivastava, Oxford Press, New Delhi 2008 Edition.

REFERENCE BOOKS:

1. **Open Channel Hydraulics** : French : Mc Graw Hill Book Company, New Delhi.
2. **Fluid Mechanics** : Modi and Seth : Standard Book Home, New Delhi.
3. **Open Channel Hydraulics** : Henderson : Mr. Millan Publishing Co. Ltd., New York.
4. **Open Channel Hydraulic** : Ven Te Chow : Mc Graw Hill Book Company, New Delhi.

SOLID WASTE MANAGEMENT

Subject Code	**10CV757**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, Land Pollution – scope and importance of solid waste management, functional elements of solid waste management.

SOURCES: Classification and characteristics – municipal, commercial & industrial. Methods of quantification.

08 Hours

UNIT - 2

COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, garbage chutes, transfer stations – bailing and compacting, route optimization techniques and problems.

06 Hours

UNIT - 3

TREATMENT / PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction, chemical reduction and biological processing problems.

6 Hours

UNIT - 4

INCINERATION: Process – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolsis, design criteria for incineration.

7 Hours

PART - B

UNIT - 5
COMPOSTING: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes. Vermicomposting.

6 Hours

UNIT - 6
SANITARY LAND FILLING: Different types, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geosynthetic fabrics in sanitary land fills.

8 Hours

UNIT - 7
DISPOSAL METHODS: Open dumping – selection of site, ocean disposal, feeding to hogs, incineration, pyrolsis, composting, sanitary land filling, merits and demerits, biomedical wastes and disposal.

6 Hours

UNIT - 8
RECYCLE AND REUSE: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.

5 Hours

REFERENCES

1. **Integrated Solid Waste Management:** Tchobanoglous : M/c Graw Hill.
2. **Solid Waste Management in developing countries.** Bhide and Sunderashan
3. **Hand book on Solid Waste Disposal**.: Pavoni J.L.
4. **Environmental Engineering**.: Peavy and Tchobanoglous
5. **Environmental Engineering – Vol II.**: S.K. Garg
6. **Biomedical waste handling rules –** 2000.
7. **Solid Waste Engineering by** Vesilind.Pa Worrell & Reinhart.D. – 2009, Cengage Learning India Private Limited, New Delhi.

NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code	**: 10CV761**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART -A

UNIT - 1

INTRODUCTION: Historical development of Numerical techniques, role in investigations, research and design in the field of civil engineering

1 Hour

DEVELOPMENT OF ALGORITHM/ FLOW CHARTS FOR FOLLOWING METHODS FOR SOLUTION OF LINEAR SIMULTANEOUS EQUATION:

a) Gaussian elimination method,
b) Gauss-Jordan matrix inversion method,
c) Gauss-Siedel method and
d) Factorization method **6 Hours**

UNIT - 2

APPLICATION OF SOLUTION OF LINEAR SYSTEM OF EQUATIONS TO CIVIL ENGINEERING PROBLEMS : Construction planning, slope deflection method applied to beams, frames and truss analysis.

5 Hours

UNIT - 3

APPLICATION OF ROOT FINDING TO CIVIL ENGINEERING PROBLEMS: Development of algorithm for a) Bisection method and b) Newton-Raphson method and its applications for solution of non linear algebraic and transcendental equations from problems in hydraulics, irrigation engineering, structural engineering and environmental engineering.

6 Hours

UNIT - 4

APPLICATION OF NUMERICAL INTEGRATION FOR SOLVING SIMPLE BEAM PROBLEMS: Development of algorithm for a) Trapezoidal rule and b) Simpson's one third rule and its application for computation of area of BMD drawn for statically determinate beams.

6 Hours

PART -B

UNIT - 5

New Marks method for computation of slopes and deflections in statically determinate beams.

6 Hours

UNIT - 6

DEVELOPMENT OF ALGORITHM AND APPLICATION OF SOLUTION OF ORDINARY DIFFERENTIAL EQUATION TO CIVIL ENGINEERING PROBLEMS BY: a) Euler's method b) Runge Kutta 4th order method

7 Hours

UNIT - 7

APPLICATION OF FINITE DIFFERENCE TECHNIQUE IN STRUCTURAL MECHANICS: i. Introduction, expression of derivatives by finite difference: backward differences, forward differences and central differences. ii. Application of finite difference method for analysis of
a) statically determinate beams, b) statically indeterminate beams

8 Hours

UNIT - 8

Application of Finite difference technique in structural mechanics (Contd..)
a) Buckling of columns, b) Beams on elastic foundation.

7 Hours

REFERENCE BOOKS:

1. **Numerical Methods for Engineers**- Chapra S.C. & R.P.Canale : McGraw Hill, 1990.
2. **Numerical methods in Engineering Problem-** N.Krishna Raju, K.U.Muthu : MacMillan Indian Limited, 1990.
3. **Numerical methods for Engineers and Scientists**- Iqbal H.Khan, Q. Hassan : Galgotia, New Delhi, 1997.
4. **Numerical methods in Computer Programs in C^{++}"** - Pallab Ghosh : Prentice Hall of India Private Limited, New Delhi, 2006.
5. **Numerical methods for engineers using MATLAB and C – I** Edition SCHILLING " Thomson Publications"

ROCK MECHANICS

Subject Code	**: 10CV762**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition, Importance, History of Rock Mechanics, Distribution of rocks – Archean Rocks, Cuddapah Rocks, Vindhyan Rocks, Palaeozoick Rocks, Mesozoic rocks, Gondwana Rocks, Deccan Traps, Steriographic presentation of Geological data – Representation and plotting line and plane

6 Hours

UNIT - 2
LABORATORY TESTS ON ROCK.S Tests for Physical Properties, Compressive strength, Tensile strength, Direct shear, Triaxial Shear, Slake Durability, Schmidt Rebound Hardness, Sound Velocity, Swelling Pressure & Free Swell, Void Index

6 Hours

UNIT – 3
STRENGTH, MODULUS AND STRESS STRAIN BEHAVIOUR OF ROCKS
Factors influencing rock behaviour, Strength criteria for Isotropic Intact Rocks, Modulus of Isotropic Intact Rocks, Compressive strength and modulus from SPT, Stress Strain models – Elastic model, Elasto plastic model, Visco elastic model

6 Hours

UNIT - 4
ENGINEERING CLASSIFICATION OF ROCK AND ROCK MASS – RQD, RMR system, Terzaghi's rock load classification, Deere Miller, CMRS and RSR System. Classification based on strength and modulus, Clasification based on strength and failure strain, rock discontinuity qualitative description, friction in rocks – Amonton's law of friction,

8 Hours

PART - B

UNIT - 5
FIELD TESTS ON ROCKS AND ROCK MASS Geophysical methods Seismc Refraction method, Electrical Resistivity method, Deformability tests – Plate Jack Test, Goodman Jack Test, Field shear test - Field Permeability Test – Open end Test, Packers Test.

6 Hours

UNIT - 6
STABILITY OF ROCK SLOPES Modes of failure – Rotational, Plane and wedge failures, Plane failure method of Analysis, Wedge method of Analysis, Toppling failure, Protection against slope failure.

6 Hours

UNIT - 7
ROCK FOUNDATION Estimation of Bearing Capacity – Intact, Fractured rocks, Stress distribution in rocks, Factor of Safety, Sliding sability of dam foundation, Settlement in rocks, Bearing capacity of piles in rock, Measures for strengthening rock mass – Concrete shear keys, Bored concrete piles, Tensioned cable anchors, concrete block at toe

6 Hours

UNIT - 8
MISCELLANEOUS TOPICS Drilling, Blasting and underground open excavation, Mining and other Engineering applications, criteria for design of underground excavations, tubular excavations, pillars and ribs support multiple excavations. Structural defects in Rock masses, their improvement

by rock bolting, grouting and other methods. Rock grouting, Rock Reinforcement

8 Hours

TEXT BOOKS:

1. **Foundation of Rock masses** - Joegar and Cook : 3rd Edition Chapman and Hall, London.
2. **Engineering in Rocks for Slopes foundations and Tunnels – Ramamurthy, T., PHI Publishers, 2007**
3. **Introduction to rock mechanics**- Goodman : : Wiley International.

REFERENCE BOOKS:

1. **Rock Mechanics and the design of structures in Rock**- : John Wiley, New York.
2. **Rock Mechanics in Engineering practice**- Ziekiewicz. O.C. and Stagg K.G. : John, Wiley, New York.

PAVEMENT MATERIALS AND CONSTRUCTION

Subject Code	**: 10CV763**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A
PAVEMENT MATERIALS

UNIT - 1

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.

6 Hours

UNIT - 2

BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.

4 Hours

UNIT - 3

BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.

8 Hours

UNIT - 4

BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no Hveem Stabilometer & Hubbar – Field Tests) bituminous mix, design methods using Rothfuch's Method only and specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.

6 Hours

PART - B

PAVEMENT CONSTRUCTION

UNIT - 5

EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

6 Hours

UNIT - 6

SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.

6 Hours

UNIT - 7

FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.

8 Hours

UNIT - 8

CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.

8 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
2. **Construction Equipment and its Management**- Sharma, S.C. : Khanna Publishers.
3. **Hot Mix Asphalt Materials, Mixture Design and Construction**- Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

REFERENCES BOOKS:

1. RRL, DSIR, '**Bituminous Materials in Road Construction**', HMSO Publication.
2. RRL, DSIR, '**Soil Mechanics for Road Engineers**', HMSO Publication.
3. Relevant IRC codes and MoRT & H specifications.

PHOTOGRAMMETRY AND REMOTE SENSING

Subject Code	**: 10CV764**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

Part A

Unit 1: Photogrammetry – Introduction, basic definitions, terrestrial photogrammetry, phototheodolite, horizontal and vertical angles from terrestrial photographs, horizontal position of a point from photographic measurements, elevation of ponts by photographic measurements, determination of focal length. **8Hours**

Unit 2: Aerial Photogrammetry- advantages, vertical, tilted and oblique photographs, geometry of vertical photographs, scale of vertical photograph over flat and variable terrain, ground coordinates, computation of length of a line, computation of flying height, relief displacement, overlaps, flight planning, computation of required number of photographs for a given area, ground control in photogrammetry **9 Hours**

Unit 3: Basics of stereoscopy, stereoscopes, uses, parallax. Basic elements in photographic interpretation. Introduction to digital photogrammetry

6Hours

Part B:

Unit 4: Remote sensing:

Introduction, Ideal remote sensing system, basic principles of electromagnetic remote sensing, electromagnetic energy, electromagnetic spectrum, interaction with earth's atmosphere, interaction with earth- surface materials, spectral reflectance of earth surface materials 6Hours

Unit 5:

Remote sensing platforms and sensors: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. Sensors-active and passive, MSS, AVHRR, LISS, TM, PAN, WIFS, microwave sensors, sensor resolutions (spatial, spectral, radiometric and temporal)

6Hours

Unit 6: Properties of digital image data, data formats,

Basics of digital image processing- radiometric and geometric corrections, image enhancements, image transforms based on arithmetic operations, image filtering 6Hours

Unit 7:

Remote sensing image interpretation, thematic classification (supervised and unsupervised) , maximum likelihood classification, introduction to accuracy assessment of classification 6Hours

Unit 8:

Applications of Remote sensing: applications in land use land cover analysis, change detection, water resources, urban planning, environmental and geological applications.

5Hours

Reference Books:

1. Mikhail E., J. Bethel, and J.C. McGlone, **Introduction to modern photogrammetry**. Wiley, 2001.
2. Wolf P.R, and B.A. Dewitt, **Elements of photogrammetry : with applications in GIS**. 3rd ed, McGraw-Hill, 2000.
3. Lillesand T.M., and R.W. Kiefer, **Remote sensing and image interpretation**. 4th ed, John Wiley & Sons, 2000.
4. Jensen J.R., **Introductory digital image processing: a remote sensing perspective**. 2nd ed Prentice Hall, 1996.
5. Richards J.A., and X. Jia, **Remote sensing digital image analysis: an introduction**. 3rd ed Springer, 1999.
6. Mather P.M., **Computer processing of remotely-sensed images: an introduction.** Wiley,1988.

AIR POLLUTION AND CONTROL

Subject Code	**10 CV765**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Definition – Classification and Characterization of Air Pollutants,

Emission Sources, Behavior and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo-chemical Smog, Coal-induced smog, Air Pollution Inventories.

6 Hours

UNIT - 2

EFFECTS OF AIR POLLUTION: On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

6 Hours

UNIT - 3

METEOROLOGY: Introduction – Meteorological Variables, Primary and Secondary Lapse Rate, Inversions, Stability Conditions, Windrose, General Characteristics of Stack Plumes, Meterological Models.

8 Hours

UNIT - 4

Factors to be considered in Industrial Plant Location and Planning
Noise pollution – sources, measurement units, effects and control

4 Hours

PART - B

UNIT - 5

SAMPLING, ANALYSIS AND CONTROL: Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement, Air Pollution Control Methods – Particulate, Emission Control, Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions, Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

16 Hours

UNIT - 6

AIR POLLUTION DUE TO AUTOMOBILES: Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

5 Hours

UNIT - 7

BURNING ENVIRONMENTAL ISSUES:

1. Acid Rain
2. Global Warming
3. Ozone Depletion in Stratosphere
4. Indoor Air Pollution

4 Hours

UNIT - 8

ENVIRONMENTAL LEGISLATION: Environmental Policy, Environmental Acts, Water, Air and Noise Pollution Standards.

3 Hours

REFERENCES

1. Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994), **Fundamentals of Air Pollution** –Academic Press.
2. Crawford, M., (1980), **Air Pollution Control Theory** –TMH Edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
3. Henry. C. Perkins, (1980), **Air Pollution** –McGraw Hill.
4. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), **Environmental Engineering** –Mc Graw Hill Book Co.
5. Sincero, A.P and Sincero, G.A., (1999), **Environmental Engineering - A Design Approach** –Prentice Hall of India.
6. Wark, K., Warner, C.F. and Davies, W.T., (1998), **Air Pollution- Its Origin and Control** –Harper & Row Publishers, New York.

DESIGN AND DRAWING OF BRIDGES

Subject Code	**: 10CV766**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) + 3 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

UNIT - 1

BRIDGE PRELIMINARIES: Classification of bridges and standard loads, Bridge-definition, components of bridges, various classification, types of bridges, forces to be considered for the design, IRC standards.

HYDRAULIC DESIGN: Methods of finding design discharge, natural, artificial and linear water ways, afflux, economic span.

SUBSTRUCTURES AND FOUNDATIONS: Types of abutments, piers and wing walls, forces to be considered for the design, Types of foundations and forces to be considered for the design, depth of scour.

6 Hours

UNIT - 2

DESIGN AND DRAWING OF RC SLAB CULVERT for IRC class-AA loading, & class A loading. Design of pipe culvert. Empirical design of bank connections. Drawing slab culvert & pipe culvert for given site particulars.

6+12 Hours

PART - B

UNIT - 3

DESIGN AND DRAWING OF RC T BEAM BRIDGE with cross beams by Piegaud's and Courbon's method for class-AA loading, empirical design of substructures and foundations.

5+12 Hours

UNIT - 4

DESIGN OF COMPOSITE BRIDGE: Design of composite bridge for EUDL, Shear connectors-design requirments for shear connectors. Drawing of composite bridge.

5+9 Hours

UNIT - 5

Typical Design and detailing of approach slab, Hand rails- Typical design and detailing of slab culverts and girder bridges as per MOT standards

4+6 Hours

TEXT BOOKS:

1. **Essentials of Bridge Engineering** : Johnson – victor : Oxford IBH Publications, New Delhi.

2. **Design of Bridges** : Krishna Raju N : Oxford IBH Publications, New Delhi.

REFERENCE BOOK:

1. **Design of Bridge Structures** : Jagadish T. R. & Jayaram M. A. : Prentice Hall of India, New Delhi.

STRUCTURAL DYNAMICS

Subject Code	**: 10CV767**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement.

6 Hours

UNIT - 2

Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading, rotation unbalance, reciprocating unbalance.

6 Hours

UNIT - 3

Duhamel's integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.

7 Hours

UNIT - 4

Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthoganality property of normal modes, eigen values.

7 Hours

PART - B

UNIT - 5

Shear buildings modeled as multi degree of freedom systems, free vibrations, natural frequencies.

6 Hours

UNIT - 6

Forced vibration motion of shear builings, modal super position method, response of shear buldings to base motion, harmonic forced excitation.

6 Hours

UNIT - 7
Damped motion of shear buildings, equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupling.

7 Hours

UNIT - 8
Dynamic analysis of beams stiffness matrices, lumped mass and consistent mass formulation equations of motion.

7 Hours

REFERENCE BOOK:

1. **Vibrations, structural dynamics**- M. Mukhopadhaya : Oxford IBH
2. **Structural Dynamics**- Mario Paz : CBS publishers.
3. **Structural Dynamics**- Anil Chopra : PHI Publishers.
4. **Structural Dynamics**- Clough & Penzen : TMH.

ENVIRONMENTAL ENGINEERING LABORATORY

Subject Code	**10CVL77**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

1. Determination of Solids in Sewage: Total Solids, Suspended Solids,Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.
2. Electrical conductivity. Determination of Chlorides and Sulphates.
3. Determination of Alkalinity, Acidity and pH.
4. Determination of Calcium, Magnesium and Total Hardness.
5. Determination of Dissolved Oxygen. Determination of BOD.
6. Determination of COD.
7. Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.
8. Jar Test for Optimum Dosage of Alum, Turbidity determination by Nephelometer.
9. Determination of Iron. Phenanthroline method.
10. Determination of Fluorides SPANDS Method.

11. MPN Determination

12. Determination Nitrates by spectrophotometer.

13. Determination of sodium and potassium by flame photometer.

REFERENCES

1. **Manual of Water and Wastewater Analysis –** NEERI Publication.
2. **Standard Methods for Examination of Water and Wastewater** (1995), American Publication – Association, Water Pollution Control Federation, American Water Works Association, Washington DC.
3. **IS Standards :** 2490-1974, 3360-1974, 3307-1974.
4. **Chemistry for Environment Engineering**. Sawyer and Mc Carthy,

CONCRETE AND HIGHWAY MATERIALS LABORATORY

Subject Code	**: 10CVL78**	IA Marks	: 25
No. of Practical Hours/Week	: 03	Exam Hours	: 03
Total No. of Practical Hours	: 42	Exam Marks	: 50

PART - A

CEMENT: Normal Consistency, Setting time, Soundness by Autoclave method, Compression strength test and Air permeability test for fineness, Specific gravity of cement.

FRESH CONCRETE: Workability – slump, Compaction factor and Vee Bee tests.

HARDENED CONCRETE: Compression strength and Split tensile tests. Test on flexural strength of RCC beams, Permeability of concrete.

PART - B

SOIL: Density of Soil by Sand replacement method, CBR Text.

AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption.

BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration,Ductility, Softening point, Flash and fire point, Viscosity, proportioning of aggregate mixes by Rothfutch Method, Marshall Stability tests.

REFERENCE BOOK:

1. Relevant IS Codes and IRC Codes.

2. **Highway Material Testing Laboratory Manual** by Khanna S K and Justo, – CEG Nemi Chand & Bros.
3. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi.

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VIII -SEMESTER

ADVANCED CONCRETE TECHNOLOGY

Subject Code	**: 10CV81**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

7 Hour

UNIT - 2

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

6 Hours

UNIT - 3

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

6 Hours

UNIT - 4

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

7 Hours

PART - B

UNIT - 5

RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix

Self compacting concrete concept, materials, tests, properties, application and Typical mix.

6 Hours

UNIT - 6

Fiber reinforced concrete - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application

7 Hours

UNIT - 7

Light weight concrete-materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix.

6 Hours

UNIT - 8

Test on Hardened concrete-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology-** M.S. Shetty
3. **Concrete Technology**- A.R. Santhakumar,-Oxford University Press.
4. **Concrete**- P.K. Mehta, P J M Monteiro,- Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute Chennai)
5. ACI Code for Mix Design
6. IS 10262-2004
7. **Concrete Mix Design**- N. Krishna Raju - Sehgal Publishers
8. **Concrete Manual**- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
9. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
10. **Advanced Concrete Technology Constituent materials**- John Newman, Ban Seng Choo- London
11. **Non-Destructive Test and Evaluation of Materials**- J.Prasad, C G K Nair,-Mc Graw Hill.
12. **High Performance Concrete**- Prof Aitcin P C- E and FN, London.
13. **Properties of Fresh Concrete**- Power T.C.- E and FN, London

DESIGN AND DRAWING OF STEEL STRUCTURES

Subject Code	**:10CV82**	IA Marks	: 25
No. of Lecture Hours/Week	: 02 (T) + 3 (D)	Exam Hours	: 04
Total No. of Lecture Hours	: 26 (T) + 39 (D)	Exam Marks	: 100

PART - A

(DRAWINGS TO BE PREPARED FOR GIVEN STRUCTURAL DETAILS)

UNIT - 1
CONNECTIONS: Bolted and welded, beam-beam, Beam-column, seated, stiffened and un-stiffened.
UNIT - 2
COLUMNS: Splices, Column-column of same and different sections. Lacing and battens.
UNIT - 3
COLUMN BASES: Slab base and gusseted base, grillage foundation.

08 (T) + 15 (D)

PART - B

UNIT - 4

Design and drawing of

i) Bolted and welded plate girder
ii) Roof Truss (Forces in the members to be given)
iii) Gantry girder

18 (T) + 24 (D)

Note : **i. In part A, Two questions to be set, out of which one question to be answered (30% weightage).**
ii. In part B, Two questions to be set, out of which one question to be answered (70% weightage).

TEXT / REFERENCE BOOKS:

1. **Structural Design & Drawing** – N.Krishna Raju, Unversities Press, India.
2. **Design of Steel Structures** - N. Subramanian : Oxford University, Press.
3. **Design of Steel Structures** - Negi - Tata Mc Graw Hill Publishers.
4. **Design of Steel Structures** - Arya and Ajaman- Nem Chand & Bros. Roorkee.
5. **Design of Steel Structures.-** Raghupati
6. IS : 800 – 2007,
7. SP 6 (1) – 1984 or Steel Table.

ADVANCED PRESTRESSED CONCRETE STRUCTURES

Subject Code	**: 10CV831**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

ANCHORAGE ZONE STRESSES IN POST-TENSIONED MEMBERS: Introduction, stress distribution in end block, investigations on Anchorage zone stresses, Magnel and Guyon's Methods, Comparative Analysis, Anchorage zone reinforcement.

6 Hours

UNIT - 2

SHEAR AND TORSIONAL RESISTANCE: Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, Torsion, Design of reinforcement for torsion.

6 Hours

UNIT - 3

COMPOSITE BEAMS: Introduction, types of composite beams, analysis for stresses, differential shrinkage, serviceability limit state. Design for flexural and shear strength.

8 Hours

UNIT – 4

TENSION MEMBERS: Introduction, Ties, Pressure pipes – fabrication process, analysis, design and specifications. Cylindrical containers - construction techniques, analysis, design and specifications.

6 Hours

PART - B

UNIT - 5

STATICALLY INDETERMINATE STRUCTURES: Introduction, Advantages of continuous members, effect of prestressing in indeterminate structures, methods of analysis for secondary moments, concordant cable profile, Guyon's theorem, Ultimate load analysis, Design of continuous beams and portal frames.

8 Hours

UNIT - 6

COMPRESSION MEMBERS: Introduction, Columns, short columns, long columns, biaxially loaded columns, Design specifications.

6 Hours

UNIT - 7

SLAB AND GRID FLOORS: Types of floor slabs, Design of one way ,two way and flat slabs. Distribution of prestressing tendons, Analysis and design of grid floors.

5 Hours

UNIT - 8

PRECAST ELEMENTS: Introduction, Prestressed concrete poles-manufacturing techniques, shapes and cross sectional properties, design loads, design principles. Railway sleepers-classification and Manufacturing techniques, design loads, analysis and design principles. Prestressed concrete pavements, slab and wall panels.

7 Hours

TEXT / REFERENCE BOOKS:

1. **Design of Prestressed concrete structures** - Lin T.Y. and H. Burns - John Wiley & Sons, 1982.
2. **Prestressed Concrete**- N. Krishna Raju - Tata Megrahill, 3rd edition, 1995.
3. **Prestressed Concrete Structures**- P. Dayaratnam - Oxford & IBH, 5th Edition, 1991.
4. **Prestressed Concrete**- G.S. Pandit and S.P. Gupta - CBS Publishers, 1993.
5. IS : 1343 : 1980.

ADVANCED FOUNDATION DESIGN

Subject Code **: 10CV832** IA Marks : 25
No. of Lecture Hours/Week : 04 Exam Hours : 03
Total No. of Lecture Hours : 52 Exam Marks : 100

PART - A

UNIT - 1

BEARING CAPACITY & SETTLEMENT: Presumptive bearing capacity according to BIS, Factors affecting bearing capacity, Factors influencing selection of depth of foundation, types of shallow foundations, Settlement of Shallow Foundations: Immediate, consolidation, & differential settlements, Factors influencing settlement, Safe Bearing Capacity and Allowable Bearing Pressure.

6 Hours

UNIT - 2

SHALLOW FOUNDATIONS: Principles of Design of foundation, Definition for Shallow and Deep foundation, Requirements for geotechnical and structural aspects of design, Proportioning of isolated footing, combined footing, Strap footing, Strip footing and Raft foundation.

6 Hours

UNIT - 3

PILE FOUNDATIONS – SINGLE PILE: Historical Development, Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test and Penetration tests, Laterally Loaded Pile.

6 Hours

UNIT - 4

PILE FOUNDATIONS – GROUP EFFECT: Pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, Under reamed piles.

7 Hours

PART - B

UNIT - 5

WELL FOUNDATIONS: Historical Development, Different shapes and characteristics of wells, Components of well foundation. Forces acting on well foundation. Sinking of wells. Causes and remedies for tilts and shifts.

6 Hours

UNIT - 6

DRILLED PIERS & CAISSONS: Construction, advantages and disadvantages of drilled piers. Design concepts and Advantages and disadvantages of open, pneumatic and floating caissons.

7 Hours

UNIT - 7

FOUNDATIONS ON EXPANSIVE SOILS: Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and Swell pressure, Free swell, Tests on expansive soils, foundation treatment for structures in expansive soil, CNS layer.

6 Hours

UNIT - 8

MACHINE FOUNDATIONS: Basic definitions in vibration, free and forced vibrations, determination of natural frequency, types of Machine foundations, general criteria for design of machine foundation.,vibration

analysis of a machine foundation, degrees of freedom of a block foundation, vibration isolation and control,
8 Hours

TEXT BOOKS:
1. **Soil Mechanics & Foundation Engineering** - V.N.S. Murthy - Pub: Sai Tech.
2. **Foundation Engineering** - Braja M. Das – Cengage Learning.
3. **Soil Mechanics Foundations** - Dr. B.C. Punmia - Pub : Laxmi publications, pvt. Ltd.

REFERENCE BOOKS:
1. **Foundation Analysis and Design** - Bowles J.E. (1996) - 5th Ed, McGraw Hill Pub. Co., New York.
2. **Advanced Foundation Engineering** - V.N.S. Murthy - Pub : Sai Tech.
3. **Pile Foundation**.- Chellies
4. **Geotechnical Engineering.-** P. Purushotham Raj
5. **Geotechnical Engineering** - Dr. C. Venkataramaiah - Pub : New age Publications.
6. **Foundation Engineering** - Dr. P.C. Varghese :- Pub : Prentice Hall of India.

PAVEMENT DESIGN

Subject Code	**: 10CV833**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Desirable characteristics of pavement, types and components, Difference between Highway pavement and Air field pavement – Design strategies of variables – Functions of sub-grade, sub base – Base course – surface course – comparison between Rigid and flexible pavement.
6 Hours

UNIT - 2
FUNDAMENTALS OF DESIGN OF PAVEMENTS: Design life – Traffic factors – climatic factors – Road geometry – Subgrade strength and drainage, Stresses and deflections, Boussinesqs theory – principle, Assumptions – Limitations and problems on above - Busmister theory – Two layered analysis – Assumptions – problems on above
6 Hours

UNIT - 3

DESIGN FACTORS: Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept.

6 Hours

UNIT - 4

FLEXIBLE PAVEMENT DESIGN: Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – IRC Method (old) - CSA Method using IRC 37-2001, problems on above.

6 Hours

PART - B

UNIT - 5

STRESSES IN RIGID PAVEMENT: Principle – Factors - wheel load and its repetition – properties of sub grade – propertie Pp ps ppppppconcrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis – Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above.

6 Hours

UNIT - 6

DESIGN OF RIGID PAVEMENT: Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tendem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above

8 Hours

UNIT - 7

FLEXIBLE PAVEMENT FAILURES, MAINTENANCE AND EVALUATION: Types of failures, causes, remedial/maintainance measures in flexible pavements – Functional Evaluation by visual inspection and unevenness measurement by using different technics - Structural Evaluation by Benkelman Beam Deflection Method, Falling weight deflectometer, GPR Method. Design factors for Runway Pavements - Design methods for Airfield pavements and problems on above.

7 Hours

UNIT - 8

RIGID PAVEMENT FAILURES, MAINTENANCE AND EVALUATION: Types of failures, causes, remedial/maintainance measures in regid pavements – Functional Evaluation by visual inspection and unevenness measurements. Design factors for Runway Pavements - Design methods for Airfield pavements.

7 Hours

TEXT BOOKS:

1. **Highway Engineering**- Khanna & Justo
2. **Principles & Practices of Highway Engineering**- L R Kadiyalli & N B. Lal
3. **Pavement Analysis & Design** - Yang H. Huang- II edition.
4. Relavent IRC codes

REFERENCE BOOKS:

1. **Principles of Pavement Design**- Yoder and Witzack - 2nd edition, John Wileys and Sons
2. **Principles of Pavement Design**- Subha Rao

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Subject Code	**:10CV834**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Earthquake ground Motion, Engineering Seismology, Theory of plate tectonics, seismic waves, Magnitude and intensity of earthquakes, local site effects, seismic zoning map of India.

6 Hours

UNIT - 2

Seismic Design Parameters. Types of Earthquakes, earthquake ground motion characteristics, response spectra and design spectrum.

6 Hours

UNIT - 3

Structural modelling, Code based seismic design methods. Response control concepts, seismic evaluation and retrofitting methods.

6 Hours

UNIT - 4

Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seismo resistant building architecture – lateral load resistant systems, building characteristics.

6 Hours

PART - B

UNIT - 5

Seismic design philosophy, Determination of design lateral forces - Equivalent lateral force procedure, dynamic analysis procedure.

8 Hours

UNIT - 6

Step by step procedure for seismic analysis of RC buildings (maximum of 4 storeys , without infills) - Equivalent static lateral force method, response spectrum methods.

7 Hours

UNIT - 7

Earthquake resistant analysis and design of RC buildings – Preliminary data, loading data, load combinations, analysis and design of subframes. (maximum of 4 storeys, without infills).

7 Hours

UNIT - 8

Earthquake resistant design of masonry buildings - elastic properties of structural masonry, lateral load analysis, Design of two storied masonry buildings.

6 Hours

TEXT / REFERENCE BOOKS:

1. **Earthquake resistant design of structures** - Pankaj Agarwal, Manish Shrikande - PHI India.
2. **Earthquake Resistant Design of Structures** - S.K. Duggal - Oxford University Press, 2007.
3. **Earthquake Resistant Design**- Anil Chopra
4. **Earth Quake Engineering Damage Assessment and Structural design**- S.F. Borg - (John Wiley and Sons. 1983).

INDUSTRIAL WASTEWATER TREATMENT

Subject Code	**: 10CV835**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Difference between Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants. Stream Sampling, effluent and stream Standards and Legislation to Control Water Pollution.

5 Hours

UNIT - 2
Stream Quality, Dissolved oxygen Sag Curve in Stream, Streeter– Phelps formulation, Numerical Problems on DO prediction.

6 Hours

UNIT - 3
TREATMENT METHODS-I: Volume Reduction, Strength Reduction, Neutralization, Equalization and Proportioning.

5 Hours

UNIT - 4
TREATMENT METHODS-II: Removal of Inorganic suspended solids, Removal of Organic Solids, Removal of suspended solids and colloids. Treatment and Disposal of Sludge Solids.

6 Hours

PART - B

UNIT - 5
COMBINED TREATMENT: Feasibility of combined Treatment of Industrial Raw Waste with Domestic Waste, Discharge of Raw, Partially Treated and completely treated Wastes to Streams.

6 Hours

UNIT - 6
TREATMENT OF SELECTED INDUSTRIAL WASTE: Process flow sheet showing origin / sources of waste water, characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of waste disposal on water bodies

THE INDUSTRIES TO BE COVERED ARE:

1. Cotton Textile Industry
2. Tanning Industry
3. Cane Sugar Industry & Distillery Industry

10 Hours

UNIT - 7

TREATMENT OF SELECTED INDUSTRIAL WASTE-I:
1. Dairy Industry
2. Canning Industry
3. Steel and Cement Industry

7 Hours

UNIT - 8

TREATMENT OF SELECTED INDUSTRIAL WASTE-II:
1. Paper and Pulp Industry
2. Pharmaceutical Industry
3. Food Processing Industry

7 Hours

REFEENCES

1. **Industrial Waste Water Treatment**- Nelsol L. Nemerow.
2. **Industrial Waste Water Treatment**.- Rao MN, and Dutta A.K.
3. **Waste Water Treatment, Disposal and Reuse** - Metcalf and Eddy inc - Tata McGraw Hill Publications, 2003.
4. **Industrial Wastewater Treatment** – Patwardhan A.D., PHI Learning Private Ltd., New Delhi, 2009
5. **Pollution Control Processes in industries-** Mahajan S.P.
6. Relevant IS Codes.

QUALITY MANAGEMENT SYSTEM IN CIVIL ENGINEERING

Subject Code	**: 10CV836**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

QUALITY MANAGEMENT SYSTEM - QMS: Introduction – Evolution of Quality Management System, Element of Quality, Quality Management System, Concept of Process, Network of Process in an organization, ISO 9000 Family, Applying ISO 9000 in practice, Importance of ISO 9000, Benefits of ISO standards of society, Total Quality Management, Comparison of ISO 9000 and TQM – Quality related definitions – Leaders in Quality or Quality Gurus – Customer Orientation – Mahatma Gandhi.

5 Hours

UNIT - 2

IMPLEMENTING ISO 9001-2000 QUALITY MANAGEMENT SYSTEM: ISO 9000 – Quality Management Principles, ISO 9000 Documents Content of ISO 9001 : 2000, ISO 9001-2000 Quality Management System Requirements, General Requirements, Documentation Requirements, Management Responsibilities, Resource Management, Product Realization, Measurement, analysis and Improvement Monitoring and Measurement, Non-conforming Product, Analysis of data, Improvement, Implementing ISO 9001-2000 Quality Management System.

5 Hours

UNIT - 3

PREPARING A ISO 9001-200 QUALITY MANAGEMENT SYSTEM FOR CIVIL ENGINEERING: Quality Manual, Introduction, Scope of the Quality Manual, Applicability, Responsibility, Quality Management System, General Requirements, Management Responsibilities, Management Commitment, Customer Focus, Indian Construction Company Quality Policy, Planning Responsibility, Authority and Communication, Management Review, Resource Management, Provision of Resources, Human Resources Product Realization, Planning or Product Realization, Customer Related Processes, Design and Development, Purchasing, Production and Service Provision, Control of Monitoring and Measuring Devices Measurement, analysis and Improvement, Monitoring and Measurement, Non-conforming product, Analysis of data, Improvement

8 Hours

UNIT - 4

QUALITY MANAGEMENT SYSTEM PROCEDURES: Introduction, procedure for management review, Format for writing procedures, procedure for preparing Quality plans/ work instructions, Contract review, Design control, Document and data control, Document numbering system, Change request, procedure for purchasing, procedure for control of customer supplied product, procedure for product identification and traceability, procedure for process control, procedure for inspection and testing, procedure for control of inspection, measuring and test equipments, procedure for inspection and test status, procedure for the control of non-conforming product, procedure for corrective and preventive action, procedure for handling, storage, packaging and delivery, control of quality records, procedure for internal quality audits.

8 Hours

PART - B

UNIT - 5

WORK INSTRUCTIONS: Introduction – Document and Data Control, Material Procurement, Material Handling, Tendering and Estimating, Planning, Design, Training, Plant and Equipment, Bar Bending Schedule, Concrete Works, Earthworks and Compaction, General Soil Investigation works, Survey works, Concrete Repair Works, Road Works, Painting Works, Water Proofing works, Drainage Works, Quality Assurance and Control, Patching and Transportation of Concrete.

5 Hours

UNIT - 6

METHOD STATEMENT: Introduction, Concrete Works, Earthworks and Compaction, General Soil Investigation works, Survey works, Concrete Repair works, Concrete Demolition works, Road Works, Fencing works etc.

5 Hours

UNIT - 7

1. **JOB DESCRIPTION:** Introduction, Job Description of : Managing Director, Project Manager, Site Manager, Site Engineer, QA/QC Engineer, Foreman, Typist/Clerk, Design Engineer, Planning Engineer.

2. **QUALITY CONTROL PLAN/INSPECTION AND TEST PLANS (ITPS):** Introduction-Preparation of Project Quality Plans, Inspection and Test plant.

8 Hours

UNIT - 8

QUALITY RECORD/FORMATS: Preparation of Standard Formats: Revision Control form, Document Distribution List, Document Master List, Non-Conformance Report, Store Issue/Receipt Voucher, Local Purchase Order, Material Stock Card, Audit Notification, Quality Audit Report, Corrective Action Report, Calibration Record, Calibration Master Sheet, Work Instruction, Job Description, Contract/Tender Review Form, Quantity Survey Estimation/Take off sheet, Material/Plant Requisition, Drawing Schedule, Bar-bending Schedule, Design Calculation Sheet, Request for Inspection, Concrete Inspection Request, Inspection Check List – Drainage, Painting, Request for Inspection-Concrete Repair, Accident Report Form, Concrete Production, Concrete Compressive Strength Test Results, Request to Conduct Cube Test, Quality Awareness Training Record.

8 Hours

REFERENCE BOOKS:

1. **Quality Management System in Civil Engineering** - D.S. Rajendra Prasad - ISO 9001-2000, Sapna Book House, Bangalore.
2. **Productivity and Quality Improvement** - John L. Hardesky - McGraw Hill Book Company.

3. **ISO 9000 Concepts, Methods, Implementation-** Bagchi - Wheeler Publishing.
4. **Training Manual on ISO 9000-2000 and TQM**- Girdhar J. Gyani - Raj Publishing House.
5. **Documenting Quality for ISO 9000 and other Industry Standards -** Gary E. MacLean -Tata McGraw Hill Publishing Company Limited.
6. **Total Quality Management for Engineers** - Mohamed Zairi - Aditya Books Private Limited.
7. **Data Book for Civil Engineers Field Practice** - Elwyn E. Seelye - John Wiley & Sons, Inc.
8. **Properties of Concrete** - A.M. Neville - ELBS Publications.
9. IS : 456-2000 : Indian Standard Specifications for Plain and Reinforced Concrete Code of Practice : 4th Revision, Bureau of Indian Standards.
10. IS : 383-1990 : Indian Standard Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete : Bureau of Indian Standards.
11. **Quality Management -** Kanishka Bedi -(Oxford university press).

FINITE ELEMENT ANALYSIS

Subject Code	**: 10CV841**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1
INTRODUCTION: Basic Concepts, Background Review: Theory of Elasticity, Matrix displacement formulation, Energy concepts, Equilibrium and energy methods for analyzing structures.

6 Hours

UNIT - 2
Raleigh **-** Ritz Method, Galerkin’s Method, Simple applications in structural analysis.

8 Hours

UNIT - 3
FUNDAMENTALS OF FINITE ELEMENT METHOD: Displacement function and natural coordinates, construction of displacement functions for 2 D truss and beam elements.

5 Hours

UNIT - 4
Applications of FEM for the analysis of plane truss, continuous beam and simple plane frame problems.

7 Hours

PART - B

UNIT - 5
ANALYSIS OF 2D CONTINUUM PROBLEMS: Elements and shape functions, Triangular, rectangular and quadrilateral elements, different types of elements, their characteristics and suitability for application.

7 Hours

UNIT - 6
Polynomial shape functions, Lagrange's and Hermitian polynomials, compatibility and convergence requirements of shape functions.

6 Hours

UNIT - 7
THEORY OF ISOPARAMETRIC ELEMENTS: Isoparametric, subparametric and super- parametric elements, characteristics of isoparametric quadrilateral elements.

7 Hours

UNIT - 8
FEM PROGRAM: Structure of computer program for FEM analysis, description of different modules, pre and post processing.

6 Hours

TEXT / REFERENCE BOOKS:

1. **Finite Element Analysis – Theory and Programming**- Krishnamoorthy – Tata McGraw Hill Co. Ltd., New Delhi.
2. **Finite Element Analysis for Engineering and Technology-** Chadrupatla, Tirupathi R., University Press, India
3. **Introduction to the Finite Element Method**- J.F. Abel and Desai. C.S. - Affiliated East West Press Pvt. Ltd., New Delhi.
4. **Finite Element Methods** - Debatis Deb - Prentice hall of India.
5. **Finite element analysis in engineering design**- Rajasekharan. S. - Wheeler Pulishers.
6. **A First Course on Finite Element Method** – Daryl L Logan, Cengage Learning
7. **The Finite Element Method**- Zienkeiwicz. O.C. - Tata McGraw Hill Co. Ltd., New Delhi.
8. **Finite Element Analysis**- S.S. Bhavikatti, - New Age International Publishers, New Delhi.

REINFORCED EARTH STRUCTURES

Subject Code **: 10CV842**
IA Marks : 25
No. of Lecture Hours/Week : 04 Exam Hours : 03
Total No. of Lecture Hours : 52 Exam Marks : 100

PART - A

UNIT- 1
BASICS OF REINFORCED EARTH CONSTRUCTION: Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwitch technique for clayey soil.
06 Hours

UNIT- 2
GEOSYNTHETICS AND THEIR FUNCTIONS
Historical developments, Recent developments, manufacturing process-woven &non-woven, Raw materials – polypropylene (polyolefin), Polyethylene (Polyoefin), Polyester, Polyvinyl chloride, Elastomers, Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics – Geotextiles, Geogrids, Geomembranes, Geocomposites, Geonets, Geofoam, Geomats, Geomeshes, Geowebs etc.
06 Hours

UNIT- 3
PROPERTIES AND TESTS ON MATERIALS
Properties – Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties
07 Hours

UNIT - 4
DESIGN OF REINFORCED EARTH RETAINING WALLS
Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, typical design problems
07 Hours

PART-B

UNIT- 5

DESIGN OF REINFORCED EARTH FOUNDATIONS AND EMBANKMENTS

Foundations - Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines.

Embankments - Concept of Reinforced Embankments, Internal and external stability, Selection of materials, typical design problems

07 Hours

UNIT - 6

SOIL NAILING TECHNIQUES

Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken.

06 Hours

UNIT- 7

GEOSYNTHETICS - FILTER, DRAIN AND LANDFILLS:

Filter & Drain – Conventional granular filter design criteria, Geosynthetic filter design requirements, Drain and filter properties, Design criteria – soil retention, Geosynthetic permeability, anticlogging, survivability and durability.

Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps

07 Hours

UNIT- 8

GEOSYNTHETICS FOR ROADS AND SLOPES

Roads - Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, Enhancing properties of subgrade, Design requirements

Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique.

06 Hours

TEXT BOOKS:

1. **Design with geosynthetics**- Koerner. R.M. - Prince Hall Publication, 2005.
2. **Construction and Geotechnical Engineering using synthetic fabrics**- Koerner. R.M. & Wesh, J.P.- Wiley Inter Science, New York, 1980.
3. **An introduction to Soil Reinforcement and Geosynthetics** – Sivakumar Babu G. L., Universities Press, Hyderabad, 2006
4. **Reinforced Soil and its Engineering Applications, Swami Saran,** I. K. International Pvt. Ltd, New Delhi, 2006
5. **Engineering with Geosynthetics**- Venkattappa Rao, G., & Suryanarayana Raju., G. V.S. - Tata Mc Graw Hill publishing Company Limited., New Delhi.

REFERENCE BOOKS:

1. **Earth reinforcement and Soil structure**- Jones CJEPButterworths, London, 1996.
2. **Geotextile Hand Book**- Ingold, T.S. & Millar, K.S. - Thomas, Telford, London.
3. **Earth Reinforcement Practices** - Hidetoshi Octial, Shigenori Hayshi & Jen Otani -Vol. I, A.A. Balkema, Rotterdam, 1992.
4. **Ground Engineer's reference Book**- Bell F.G. - Butterworths, London, 1987.
5. **Reinforced Earth**- Ingold, T.S. - Thomas, Telford, London.
6. **Geosynthetics in Civil Engineering**, Editor Sarsby R W, Woodhead Publishing Ltd & CRC Press, 2007

URBAN TRANSPORT PLANNING

Subject Code	**: 10CV843**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Scope of Urban transport planning – Inter dependency of land use and traffic – System Approach to urban planning.

6 Hours

UNIT - 2

STAGES IN URBAN TRANSPORT PLANNING: Trip generation – Trip production - Trip distribution – Modal split – Trip assignment.

6 Hours

UNIT - 3

URBAN TRANSPORT SURVEY - Definition of study area-Zoning-Types of Surveys – Inventory of transportation facilities – Expansion of data from sample.

8 Hours

UNIT - 4

TRIP GENERATION: Trip purpose – Factors governing trip generation and attraction – Category analysis – Problems on above

5 Hours

PART - B

UNIT - 5

TRIP DISTRIBUTION: Methods – Growth factors methods – Synthetic methods – Fractor and Furness method and problems on the above.

5 Hours

UNIT - 6

MODAL SPLIT: Factors affecting – characteristics of split – Model split in urban transport planning – problems on above

6 Hours

UNIT - 7

TRIP ASSIGNMENT: Assignment Techniques – Traffic fore casting – Land use transport models – Lowry Model – Garin Lowry model – Applications in India – (No problems on the above)

8 Hours

UNIT - 8

URBAN TRANSPORT PLANNING FOR SMALL AND MEDIUM CITIES: Introduction – Difficulties in transport planning – Recent Case Studies

8 Hours

TEXT BOOKS:

1. **Traffic Engineering and Transport Planning**- L.R. Kadiyali - Khanna Publishers.
2. **Principles of urban transport system planning** - B.G. Hutchinson - Scripta Book Co., Washington D.C. & McGraw Hill Book Co.
3. **Introduction to transportation engineering**- Jotin Kristey and Kentlal - PHI, New Delhi.

REFERENCE BOOKS:

1. **Urban Transport planning**- Black John - Croom Helm ltd, London.
2. **Urban and Regional models in geography and planning**- Hutchison B G - John Wiley and sons London.
3. **Entropy in urban and regional modeling**- Wilson A G - Pion ltd, London.

GEOGRAPHIC INFORMATION SYSTEM

Subject Code	**: 10CV844**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Geographic Information system concepts and spatial models. Introduction, Spatial information, temporal information, conceptual models of spatial information, representation of geographic information. GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

7 Hours

UNIT - 2

Computer Fundamentals of GIS and Data storage, Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection : Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.

8 Hours

UNIT - 3

GIS DATA MODELS AND STRUCTURES – Cartographic map model, Geo-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.

5 Hours

UNIT - 4

DIGITIZING EDITING AND STRUCTURING MAP DATA – Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.

5 Hours

PART - B

UNIT - 5

DATA QUALITY AND SOURCES OF ERROR – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS.

10 Hours

UNIT - 6

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, role based systems, network analysis, special interaction modeling, Virtual GIS.

6 Hours

UNIT - 7

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling.

6 Hours

UNIT - 8

Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

5 Hours

TEXT BOOKS:

1. **Principles of GIS** - Peter A Burrough Reachael A Mc. Donnel - (Oxford).
2. **The GIS Book** - George B. Korte, P.E. - 5th Edn., Thomson Learning.
3. **Remote sensing and image interpretation** - Lillesand - (John Wiley and Sons).
4. **Geographical Information system**: Bemhard Sen-Wiley publications.
5. **GIS and Computer cartography** - Christopher Jones - (Longman).

REFERENCE BOOKS:

1. **Fundamentals of Remote Sensing –** George Joseph, Universities Press, Hyderabad.
2. **Introduction to GIS – Kang tsuang Chang –** Tata McGraw Hill, New Delhi 2009.
3. **Geographical Information Science –** Narayan Panigrahi, Universities Press, New Delhi 2010.
4. **Geographical Information system & Environmental Modeling**: Keith C. Clarke, Bradley O Parks, Michel P. Crane, PHI Learning, New Delhi 2009 Edition.
5. **Concepts and Techniques of Geographic Information Systems –** C.P.Lo. Albert K.W. Yeung, PHI Learning, New Delhi – 2009 2nd Edition.

ADVANCED DESIGN OF STEEL STRUCTURES

Subject Code	**:10CV845**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

INTRODUCTION: Basic principles of design, stress strain relationship for mild steel, shape factors for different cross sections. Evaluation of full plastic moment for mild steel beams, plastic hinges - Fixed, simply supported beams, effect of partial fixity, rectangular portal frames and gable frames.

5 Hours

UNIT - 2

Statement of theorems with examples, application of principles of virtual work, partial and over collapse. Trial error method. Method of combined mechanisms, plastic moment distribution method and other methods of determining plastic collapse load. Estimation of deflection, factors affecting fully plastic moment.

7 Hours

UNIT - 3

Minimum weight theories. Application of theorems and methods of solution. Plastic analysis applied to the design of fixed and continuous beams, portal and gable frames.

8 Hours

UNIT - 4

Design of Built-up beams. Design of encased beams.

6 Hours

PART - B

UNIT - 5

Design of open web structures - Advantages and design methods

7 Hours

UNIT - 6

Small moment resistant connections, large moment resistant connections, semi-rigid and behavior of semi-rigid connections, Beam line method, modified slope deflection method, modified moment distribution method.

8 Hours

UNIT - 7

Principal axes of section, maximum stress due to unsymmetrical bending, the Z-polygon, deflection of beams under unsymmetrical bending, design of purlins subjected to unsymmetrical bending.

5 Hours

UNIT - 8

Tubular structures – Introduction, permissible stresses, tubular columns and compression members, tubular tension members. Design of tubular members roof truss for given member forces and their combination, joints in tubular trusses, design of tubular beams and purlins.

6 Hours

TEXT/REFERENCE BOOKS:

1. **Plastic Analysis**- B.G. Neal.
2. **Introduction to Plastic Analysis of Steel Structures**- J.F. Banker and Heyman
3. **Plastic Analysis of steel structures**.- Beedle
4. **Design of steel structures** – William T.Segui, Cengage Learning, India-2007.
5. **Steel Structures Vol - 1 and 2**- J.F. Baker
6. **Design of Steel Structures**- Ramachandra.
7. **Design of Steel Structures**.- Arya and Ajmani
8. CMERI Design Hand Book for Open Web Structures, Durgapur.
9. SP-6 (6) , IS : 800-2007,Steel Table

WATER RESOURCES ENGINEERING

Subject Code	**: 10CV 846**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

UNIT:1 INTRODUCTION

Introduction, The world's fresh water resources, water use in the world, water management sectors, the water management community, the future of water resources. 06 hrs.

UNIT:2 HYDROLOGIC PROCESS

Introduction to hydrology, hydrologic cycle, atmospheric and ocean circulation.

Precipitation: formation and types, rainfall variability, disposal of rainfall on a watershed, design storms. 06 hrs.

UNIT:3 SURFACE RUNOFF

Drainage basins, hydrologic losses and rainfall excess, rainfall-runoff analysis using unit hydrograph approach, SCS rainfall-runoff relation.
07 hrs.

UNIT:4 WATER WITHDRAWLS AND USES

Water use data: classification of uses, water for energy. Water for agriculture: irrigation trends and needs, irrigation infrastructures, irrigation system selection and performance, water requirement for irrigation, impacts of irrigation Drought management: options, severity, economic aspects of water storage.

Analysis of surface water supply: surface water reservoir systems, storage-firm yield analysis for water supply reservoir simulation.
08 hrs.

UNIT:5 FLOOD CONTROL

Introduction, flood plain management, flood plain definition, hydrologic and hydraulic analysis of floods, storm water management.

Flood control alternatives: structural and non-structural measures.

Flood damage and net benefit estimation: damage relationships, expected damages, risk based analysis.

Operation of reservoir systems for flood control.
08 hrs.

UNIT:6 STORM WATER CONTROL:

Storm water management, storm system: information needs and design criteria. Rational method design. Hydraulic analysis of design, storm sewer appurtenances.

Storm detention: effects of urbanisation, types of surface detention, subsurface disposal of storm water. 07 hrs.

UNIT:7 STORM WATER CONTROL STREET AND HIGHWAY DRAINAGE AND CULVERTS:

Drainage of street and highway pavements: design considerations, flow in gutters, pavement drainage inlets, inlet locations, median, embankment and bridge culvert design.

Hydraulic design of culverts: culvert hydraulics, culver design.
08 hrs.

UNIT:8 DESIGN OF SPILLWAYS FOR FLOOD CONTROL, STORAGE AND CONVEYANCE SYSTEM:

Hydrologic considerations, Dams: types, hazard classification, spillway capacity, criteria, safety of existing dams.

Spillways: functions, overflow and free overfall spillways, ogee spillways, baffled chute spillways, culvert spillways.

Gates and valves: spillway crest gates, gates for outlet works, valves for outlet works. 08 hrs.

Text Books:

1. Water resources engineering: Ralph A Wurbs, Wesley P. James, PHI Learning pvt. Ltd. New Delhi (2009 Ed.).
2. water resources engineering: Chin D.A., Prentice Hall (2009 Ed.).

3. wate resources engineering: Larry W. Mays, John Wiley & sons (2005).

Reference Books:

1. Water resources engineering : Sathya Narayana Murthy Challa, New Age International Publishers, New Delhi, (2002 Ed.).
2. Water resources engineering, lecture notes, IIT Kharagpur.
3. Elements of water resources engineering, Duggal K.N., Soni J.P., New age international publishers, New Delhi.
4. Water resources engineering, David Chin, Pearson Educaion, NJ, (2006 Ed.).

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ENVIRONMENTAL IMPACT ASSESSMENT

Subject Code	**: 10CV847**	IA Marks	: 25
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 52	Exam Marks	: 100

PART - A

UNIT - 1

Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information,

6 Hours

UNIT - 2

Step-by-step procedures for conducting EIA, Limitations of EIA.

6 Hours

UNIT - 3

Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

8 Hours

UNIT - 4

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

PART - B

UNIT - 5
EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

6 Hours

UNIT - 6
Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.

6 Hours

UNIT - 7
Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.

4 Hours

UNIT - 8
EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

10 Hours

REFERENCES

1. **Environmental Impact Analysis**-Jain R.K.-Van Nostrand Reinhold Co.
2. **Environment Impact Assessment.-** Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. **Environment Impact Assessment** - Larry W. Canter - McGraw Hill Publication.

Computer Science Engineering

Scheme and Syllabus of Semesters III to VIII of B.E
(With effect from 2010-2011)

Information Science and Engineering

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

SCHEME OF TEACHING AND EXAMINATION

B.E. INFORMATION SCIENCE AND ENGINEERING

(Common to CSE & ISE)

III SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Exam	Total
1	10MAT31	Engineering Mathematics - III	Mathematics	04	-	03	25	100	125
2	10CS32	Electronic Circuits	CSE/ISE	04	-	03	25	100	125
3	10CS33	Logic Design	CSE/ISE	04	-	03	25	100	125
4	10CS34	Discrete Mathematical Structures	CSE/ISE	04	-	03	25	100	125
5	10CS35	Data Structures with C/C++	CSE/ISE	04	-	03	25	100	125
6	10CS36	Object Oriented Programming with C++	CSE/ISE	04	-	03	25	100	125
7	10CSL37	Data Structures with C/C++ Laboratory	CSE/ISE	-	03	03	25	50	75
8	10CSL38	Electronic Circuits & Logic Design Laboratory	CSE/ISE	-	03	03	25	50	75
Total				24	06	-	200	700	900

SCHEME OF TEACHING AND EXAMINATION

B.E. INFORMATION SCIENCE AND ENGINEERING

(Common to CSE & ISE)

IV SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Exam	Total
1	10MAT41	Engineering Mathematics - IV	Maths	04	-	03	25	100	125
2	10CS42	Graph Theory and Combinatorics	CSE/ISE	04	-	03	25	100	125
3	10CS43	Design and Analysis of Algorithms	CSE/ISE	04	-	03	25	100	125
4	10CS44	Unix and Shell Programming	CSE/ISE	04	-	03	25	100	125
5	10CS45	Microprocessors	CSE/ISE	04	-	03	25	100	125
6	10CS46	Computer Organization	CSE/ISE	04	-	03	25	100	125
7	10CSL47	Design and Analysis of Algorithms Laboratory	CSE/ISE	-	03	03	25	50	75
8	10CSL48	Microprocessors Laboratory	CSE/ISE	-	03	03	25	50	75
Total				24	06	-	200	700	900

SCHEME OF TEACHING AND EXAMINATION

B.E. INFORMATION SCIENCE AND ENGINEERING

V SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Exam	Total
1	10IS51	Software Engineering	CSE/ISE	04	-	03	25	100	125
2	10CS52	Systems Software	CSE/ISE	04	-	03	25	100	125
3	10CS53	Operating Systems	CSE/ISE	04	-	03	25	100	125
4	10CS54	Database Management Systems	CSE/ISE	04	-	03	25	100	125
5	10CS55	Computer Networks - I	CSE/ISE	04	-	03	25	100	125
6	10CS56	Formal Languages and Automata Theory	CSE/ISE	04	-	03	25	100	125
7	10CSL57	Database Applications Laboratory	CSE/ISE	-	03	03	25	50	75
8	10CSL58	Systems Software & Operating Systems Laboratory	CSE/ISE	-	03	03	25	50	75
Total				24	06	-	200	700	900

SCHEME OF TEACHING AND EXAMINATION
B.E. INFORMATION SCIENCE AND ENGINEERING

VI SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Exam	Total
1	10AL61	Management and Entrepreneurship	CSE/ISE/ MBA	04	-	03	25	100	125
2	10CS62	Unix Systems Programming	CSE/ISE	04	-	03	25	100	125
3	10IS63	File Structures	CSE/ISE	04	-	03	25	100	125
4	10CS64	Computer Networks - II	CSE/ISE	04	-	03	25	100	125
5	10IS65	Software Testing	CSE/ISE	04	-	03	25	100	125
6	10IS66x	Elective I (Group-A)	CSE/ISE	04	-	03	25	100	125
7	10ISL67	File Structures Laboratory	CSE/ISE	-	03	03	25	50	75
8	10ISL68	Software Testing Laboratory	CSE/ISE	-	03	03	25	50	75
Total				24	06	-	200	700	900

Elective I – Group A

10IS661/10CS661	Operations Research
10IS662/10CS63	Compiler Design
10IS663/10CS663	Data Compression
10IS664/10CS664	Pattern Recognition
10IS665/10CS65	Computer Graphics and Visualization
10IS666/10CS666	Programming Languages

Note: Software Testing Lab to be implemented in UNIX environment

SCHEME OF TEACHING AND EXAMINATION

B.E. INFORMATION SCIENCE AND ENGINEERING

VII SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Exam	Total
1	10CS71	Object Oriented Modeling and Design	CSE/ISE	04	-	03	25	100	125
2	10IS72	Information Systems	CSE/ISE	04	-	03	25	100	125
3	10CS73	Programming the Web	CSE/ISE	04	-	03	25	100	125
4	10IS74/ 10CS755	Data Warehousing and Data Mining	CSE/ISE	04	-	03	25	100	125
5	10IS75x	Elective II (Group-B)	CSE/ISE	04	-	03	25	100	125
6	10IS76x	Elective III(Group-C)	CSE/ISE	04	-	03	25	100	125
7	10CSL77	Networks Laboratory	CSE/ISE	-	03	03	25	50	75
8	10CSL78	Web Programming Laboratory	CSE/ISE	-	03	03	25	50	75
Total				24	06	-	200	700	900

Elective II – Group B

10IS751/10CS751	Advanced DBMS
10IS752/10CS72	Embedded Computing Systems
10IS753/10CS753	JAVA and J2EE
10IS754/10CS754	Multimedia Computing
10IS755	Advanced Software Engineering
10IS756/10CS756	Neural Networks

Elective III – Group C

10IS761/10CS761	C# Programming and .Net
10IS762/10CS762	Digital Image Processing
10IS763/10CS763	Game Theory
10IS764/10CS764	Artificial Intelligence
10IS765/10CS765	Storage Area Networks
10IS766/10CS766	Fuzzy Logic

SCHEME OF TEACHING AND EXAMINATION

B.E. INFORMATION SCIENCE AND ENGINEERING

VIII SEMESTER

S. No.	Subject Code	Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration	Marks		
							IA	Exam	Total
1	10IS81	Software Architectures	CSE/ISE	04	-	03	25	100	125
2	10CS82	System Modeling and Simulation	CSE/ISE	04	-	03	25	100	125
3	10IS83x	Elective IV(Group-D)	CSE/ISE	04	-	03	25	100	125
4	10IS84x	Elective V(Group-E)	CSE/ISE	04	-	03	25	100	125
5	10IS85	Project Work	ISE		06	03	100	100	200
6	10IS86	Seminar	ISE		-	-	50	-	50
Total				16	06		250	500	750

Elective IV – Group D

10IS831/10CS831	Wireless Networks and Mobile Computing
10IS832/10CS832	Web 2.0 and Rich Internet Applications
10IS833	User Interface Design
10IS834/10CS834	Network Management Systems
10IS835/10CS835	Information and Network Security
10IS836/10CS836	Microcontroller-Based Systems

Elective V– Group E

10IS841/10CS841	Ad-hoc Networks
10IS842	Information Retrieval
10IS843	Supply Chain Management
10IS844/10CS844	Services Oriented Architecture
10IS845/10CS845	Clouds, Grids and Clusters
10IS846	Decision Support Systems

NOTE: Students have to register for one Elective from each of the five Elective Group

III SEMESTER

ENGINEERING MATHEMATICS III
(Common to CSE & ISE)

Subject Code: 10MAT31	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Fourier Series: Periodic functions, Fourier expansions, Half range expansions, Complex form of Fourier series, Practical harmonic analysis.

UNIT - 2 **6 Hours**

Fourier Transforms: Finite and Infinite Fourier transforms, Fourier sine and consine transforms, properties. Inverse transforms.

UNIT – 3 **6 Hours**

Partial Differential Equations (P.D.E): Formation of P.D.E Solution of non homogeneous P.D.E by direct integration, Solution of homogeneous P.D.E involving derivative with respect to one independent variable only (Both types with given set of conditions) Method of separation of variables. (First and second order equations) Solution of Lagrange's linear P.D.E. of the type P p + Q q = R.

UNIT - 4 **7 Hours**

Applications of P.D.E: Derivation of one dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional Laplace's equation – various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems)

PART – B

UNIT – 5 **6 Hours**

Numerical Methods: Introduction, Numerical solutions of algebraic and transcendental equations:- Newton-Raphson and Regula-Falsi methods. Solution of linear simultaneous equations : **-** Gauss elimination and Gauss Jordon methods. Gauss **-** Seidel iterative method. Definition of eigen values and eigen vectors of a square matrix. Computation of largest eigen value and the corresponding eigen vector by Rayleigh's power method.

UNIT - 6 **7 Hours**

Numerical Methods *contd.*: Finite differences (Forward and Backward differences) Interpolation, Newton's forward and backward interpolation formulae. Divided differences – Newton's divided difference formula. Lagrange's interpolation and inverse interpolation formulae. Numerical differentiation using Newton's forward and backward interpolation formulae. Numerical Integration – Simpson's one third and three eighth's value, Weddle's rule (All formulae / rules without proof)

UNIT - 7 **6 Hours**

Calculus of Variations: Variation of a function and a functional Extremal of a functional, Variational problems, Euler's equation, Standard variational problems including geodesics, minimal surface of revolution, hanging chain and Brachistochrone problems.

UNIT - 8 **7 Hours**

Difference Equations and Z-transforms: Difference equations – Basic definitions. Z-transforms – Definition, Standard Z-transforms, Linearity property, Damping rule, Shifting rule, Initial value theorem, Final value theorem, Inverse Z-transforms. Application of Z-transforms to solve difference equations

Text Book:
1. B.S. Grewal: Higher Engineering Mathematics, 40th Edition, Khanna Publishers, 2007.
   (Chapters: 10, 22.1 to 22.5, 17.1 to 17.5, 18.1 to 18.2, 18.4 to 18.5, 18.7, 28.1 to 28.2, 28.4 to 28.9, 29.1, 29.5, 29.8 to 29.12, 34.1 to 34.5, 30.1 to 30.2, 23.1 to 23.5, 23.7, 23.9 to 23.11, 23.16)

Reference Books:
1. B.V. Ramana: Higher Engineering Mathematics, Tata Mcgraw Hill, 2006.
2. Glyn James: Advanced Modern Engineering Mathematics, 3rd Edition, Pearson Education, 2003.

ELECTRONIC CIRCUITS

(Common to CSE & ISE)

Subject Code: 10CS32	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT - 1 **7 Hours**

Transistors, UJTs, and Thyristors: Operating Point, Common-Emitter Configuration, Thermal Runaway, Transistor Switch, Unijunction Transistors, PNPN Diode, SCR.

UNIT - 2 **6 Hours**

Field Effect Transistors: Bipolar Junction Transistors versus Field Effect Transistors, Junction Field Effect Transistors, Metal Oxide Field Effect Transistors, FET Parameters and Specifications, Differences between JFETs and MOSFETs, Handling MOSFETs, Biasing JFETs, Biasing MOSFETs, FET Applications, Testing FETs, Dual-Gate MOSFET, VMOS Devices, CMOS Devices, Insulated Gate Bipolar Transistors (IGBTs)

UNIT - 3 **6 Hours**

Optoelectronic Devices: Introduction, Photosensors, Photoconductors, Photodiodes, Phototransistors, Light-Emitting Diodes, Liquid Crystal Displays, Cathode Ray Tube Displays, Emerging Display Technologies, Optocouplers

UNIT - 4 **7 Hours**

Small Signal Analysis of Amplifiers: Amplifier Bandwidth: General Frequency Considerations, Hybrid h-Parameter Model for an Amplifier, Transistor Hybrid Model, Analysis of a Transistor Amplifier using complete h-Parameter Model, Analysis of a Transistor Amplifier Configurations using Simplified h-Parameter Model, Small-Signal Analysis of FET Amplifiers, Cascading Amplifiers, Darlington Amplifier, Cascode Amplifiers, Low-Frequency Response of Amplifiers, Low-Frequency Response of Cascaded Amplifier Stages.

PART - B

UNIT - 5 **6 Hours**

Large Signal Amplifiers, Feedback Amplifier: Classification and characteristics of Large Signal Amplifiers, Feedback Amplifiers: Classification of Amplifiers, Amplifier with Negative Feedback, Advantages of Negative Feedback, Feedback Topologies, Voltage-Series (Series-Shunt) Feedback, Voltage-Shunt (Shunt-Shunt) Feedback, Current-Series (Series-Series) Feedback, Current-Shunt (Shunt-Series) Feedback.

UNIT - 6 **7 Hours**

Sinusoidal Oscillators, Wave-Shaping Circuits: Classification of Oscillators, Conditions for Oscillatons: Barkhausen Criterion, Types of Oscillators, Crystal Oscillator, Voltage-Controlled Oscillators, Frequency Stability.
Wave-Shaping Circuits: Basic RC Low-Pass Circuit, RC Low-Pass Circuit as Integrator, Basic RC High-Pass Circuit, RC High-Pass Circuit as Differentiator, Basic RL Circuit as Integrator, Basic RL Circuit as Differentiator, Multivibrators, Integrated Circuit (IC) Multivibrators.

UNIT - 7 **7 Hours**

Linear Power Supplies, Switched mode Power Supplies: Linear Power Supplies: Constituents of a Linear Power Supply, Designing Mains Transformer, Linear IC Voltage Regulators, Regulated Power Supply Parameters.
Switched Mode Power Supplies: Switched Mode Power Supplies, Flyback Converters, Forward Converter, Push-Pull Converter, Switching Regulators, Connecting Power Converters in Series, Connecting Power Converters in Parallel

UNIT - 8 **6 Hours**

Operational Amplifiers: Ideal Opamp versus Practical Opamp, Performance Parameters, Some Applications: Peak Detector Circuit, Absolute Value Circuit, Comparator, Active Filters, Phase Shifters, Instrumentation Amplifier, Non-Linear Amplifier, Relaxation Oscillator, Current-To-Voltage Converter, Voltage-To-Current Converter, Sine Wave Oscillators.

Text Book:

1. Anil K Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley, 2009.
   (4.1, 4.2, 4.7, 4.8, 5, 6.1, 6.2, 6.3, 7.1 to 7.5, 7.10 to 7.14, 8, 10.1, 11, 12.1, 12.2, 12.3, 12.5, 13.1 to 13.6, 13.9, 13.10, 14.1, 14.2, 14.6, 14.7, 15)

Reference Books:

1. Jacob Millman, Christos Halkias, Chetan D Parikh: Millman’s Integrated Electronics – Analog and Digital Circuits and Systems, 2nd Edition, Tata McGraw Hill, 2010.
2. R. D. Sudhaker Samuel: Electronic Circuits, Sanguine-Pearson, 2010.

LOGIC DESIGN
(Common to CSE & ISE)

Subject Code: 10CS33	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART-A

UNIT – 1 **7 Hours**

Digital Principles, Digital Logic: Definitions for Digital Signals, Digital Waveforms, Digital Logic, 7400 TTL Series, TTL Parameters The Basic Gates: NOT, OR, AND, Universal Logic Gates: NOR, NAND, Positive and Negative Logic, Introduction to HDL.

UNIT – 2 **6 Hours**

Combinational Logic Circuits

Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method, Hazards and Hazard Covers, HDL Implementation Models.

UNIT – 3 **6 Hours**

Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, Encoders, Exclusive-or Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays, HDL Implementation of Data Processing Circuits

UNIT – 4 **7 Hours**

Clocks, Flip-Flops: Clock Waveforms, TTL Clock, Schmitt Trigger, Clocked D FLIP-FLOP, Edge-triggered D FLIP-FLOP, Edge-triggered JK FLIP-FLOP, FLIP-FLOP Timing, JK Master-slave FLIP-FLOP, Switch Contact Bounce Circuits, Various Representation of FLIP-FLOPs, Analysis of Sequential Circuits, HDL Implementation of FLIP-FLOP

PART-B

UNIT – 5 **6 Hours**

Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers, Register Implementation in HDL

UNIT – 6 **7 Hours**

Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus, Decade Counters, Presettable Counters, Counter Design as a Synthesis problem, A Digital Clock, Counter Design using HDL

UNIT – 7 **7 Hours**

Design of Synchronous and Asynchronous Sequential Circuits: Design of Synchronous Sequential Circuit: Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, Implementation using Read Only Memory, Algorithmic State Machine, State Reduction Technique.
Asynchronous Sequential Circuit: Analysis of Asynchronous Sequential Circuit, Problems with Asynchronous Sequential Circuits, Design of Asynchronous Sequential Circuit, FSM Implementation in HDL

UNIT – 8 **6 Hours**

D/A Conversion and A/D Conversion: Variable, Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, A/D Converter-Simultaneous Conversion, A/D Converter-Counter Method, Continuous A/D Conversion, A/D Techniques, Dual-slope A/D Conversion, A/D Accuracy and Resolution

Text Book:

1. Donald P Leach, Albert Paul Malvino & Goutam Saha: Digital Principles and Applications, 7th Edition, Tata McGraw Hill, 2010.

Reference Books:

1. Stephen Brown, Zvonko Vranesic: Fundamentals of Digital Logic Design with VHDL, 2nd Edition, Tata McGraw Hill, 2005.
2. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2010.
3. Charles H. Roth: Fundamentals of Logic Design, Jr., 5th Edition, Thomson, 2004.

4. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007.
5. M Morris Mano: Digital Logic and Computer Design, 10th Edition, Pearson, 2008.

DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE & ISE)

Subject Code: 10CS34	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Set Theory: Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, A First Word on Probability, Countable and Uncountable Sets

UNIT – 2 **7 Hours**
Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference

UNIT – 3 **6 Hours**
Fundamentals of Logic *contd.*: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems

UNIT – 4 **7 Hours**
Properties of the Integers: Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions

PART – B

UNIT – 5 **7 Hours**
Relations and Functions: Cartesian Products and Relations, Functions – Plain and One-to-One, Onto Functions – Stirling Numbers of the Second Kind, Special Functions, The Pigeon-hole Principle, Function Composition and Inverse Functions

UNIT – 6 **7 Hours**
Relations *contd.*: Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions

UNIT – 7 **6 Hours**
Groups: Definitions, Examples, and Elementary Properties, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets, and Lagrange's Theorem.
Coding Theory and Rings: Elements of Coding Theory, The Hamming Metric, The Parity Check, and Generator Matrices

UNIT – 8 **6 Hours**
Group Codes: Decoding with Coset Leaders, Hamming Matrices
Rings and Modular Arithmetic: The Ring Structure – Definition and Examples, Ring Properties and Substructures, The Integers Modulo n

Text Book:
1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, , 5th Edition, Pearson Education, 2004. (Chapter 3.1, 3.2, 3.3, 3.4, Appendix 3, Chapter 2, Chapter 4.1, 4.2, Chapter 5.1 to 5.6, Chapter 7.1 to 7.4, Chapter 16.1, 16.2, 16.3, 16.5 to 16.9, and Chapter 14.1, 14.2, 14.3).

Reference Books:
1. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007.
2. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.
3. D.S. Malik and M.K. Sen: Discrete Mathematical Structures: Theory and Applications, Thomson, 2004.
4. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.

DATA STRUCTURES WITH C
(Common to CSE & ISE)

Subject Code: 10CS35 | **I.A. Marks : 25**
Hours/Week : 04 | **Exam Hours: 03**
Total Hours : 52 | **Exam Marks: 100**

PART – A

UNIT - 1 **8 Hours**
BASIC CONCEPTS: Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Performance Analysis, Performance Measurement

UNIT - 2 **6 Hours**
ARRAYS and STRUCTURES: Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays

UNIT - 3 **6 Hours**
STACKS AND QUEUES: Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues.

UNIT - 4 **6 Hours**
LINKED LISTS: Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists

PART - B

UNIT - 5 **6 Hours**
TREES – 1: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps.

UNIT - 6 **6 Hours**
TREES – 2, GRAPHS: Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees, The Graph Abstract Data Type.

UNIT - 7 **6 Hours**
PRIORITY QUEUES Single- and Double-Ended Priority Queues, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps.

UNIT - 8 **8 Hours**
EFFICIENT BINARY SEARCH TREES: Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees.

Text Book:
1. Horowitz, Sahni, Anderson-Freed: Fundamentals of Data Structures in C, 2nd Edition, University Press, 2007.
   (Chapters 1, 2.1 to 2.6, 3, 4, 5.1 to 5.3, 5.5 to 5.11, 6.1, 9.1 to 9.5, 10)

Reference Books:
1. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.
2. Richard F. Gilberg and Behrouz A. Forouzan: Data Structures A Pseudocode Approach with C, Thomson, 2005.
3. Robert Kruse & Bruce Leung: Data Structures & Program Design in C, Pearson Education, 2007.

OBJECT ORIENTED PROGRAMMING WITH C++
(Common to CSE & ISE)

Subject Code: 10CS36 | **I.A. Marks : 25**
Hours/Week : 04 | **Exam Hours: 03**
Total Hours : 52 | **Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**

Introduction: Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types
Function Components, argument passing, inline functions, function overloading, recursive functions

UNIT 2 **7 Hours**

Classes & Objects – I: Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Parameterized constructors, Static data members, Functions

UNIT 3 **7 Hours**

Classes & Objects –II: Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Copy constructors, Generic functions and classes, Applications
Operator overloading using friend functions such as +, - , pre-increment, post-increment, [ ] etc., overloading <<, >>.

UNIT 4 **6 Hours**

Inheritance – I: Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes

PART – B

UNIT 5 **6 Hours**

Inheritance – II: Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes

UNIT 6 **7 Hours**

Virtual functions, Polymorphism: Virtual function, Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, Pure virtual functions, Abstract classes, Using virtual functions, Early and late binding.

6 Hours

UNIT 7

I/O System Basics, File I/0: C++ stream classes, Formatted I/O, I/O manipulators, fstream and the File classes, File operations

UNIT 8 **7 Hours**

Exception Handling, STL: Exception handling fundamentals, Exception handling options
STL: An overview, containers, vectors, lists, maps.

Text Books:

1. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.

Reference Books:

1. Stanley B.Lippmann, Josee Lajore: C++ Primer, 4th Edition, Addison Wesley, 2005.
2. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
3. K R Venugopal, Rajkumar Buyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 1999.

DATA STRUCTURES WITH C/C++ LABORATORY
(Common to CSE & ISE)

Subject Code: 10CSL37	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Using circular representation for a polynomial, design, develop, and execute a program in C to accept two polynomials, add them, and then print the resulting polynomial.

2. Design, develop, and execute a program in C to convert a given valid parenthesized infix arithmetic expression to postfix expression and then to print both the expressions. The expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).

3. Design, develop, and execute a program in C to evaluate a valid postfix expression using stack. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).

4. Design, develop, and execute a program in C to simulate the working of a queue of integers using an array. Provide the following operations:
   a. Insert b. Delete c. Display

5. Design, develop, and execute a program in C++ based on the following requirements:
   An EMPLOYEE class is to contain the following data members and member functions:
   Data members: Employee_Number (an integer), Employee_Name (a string of characters), Basic_Salary (an integer) , All_Allowances (an integer), IT (an integer), Net_Salary (an integer).
   Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members.
   (All_Allowances = 123% of Basic; Income Tax (IT) = 30% of the gross salary (= basic_Salary _ All_Allowance); Net_Salary = Basic_Salary + All_Allowances – IT)

6. Design, develop, and execute a program in C++ to create a class called STRING and implement the following operations. Display the results after every operation by overloading the operator <<.
   i. STRING s1 = "VTU"
   ii. STRING s2 = "BELGAUM"
   iii. STIRNG s3 = s1 + s2; (Use copy constructor)

7. Design, develop, and execute a program in C++ to create a class called STACK using an array of integers and to implement the following operations by overloading the operators + and - :
   i. s1=s1 + element; where s1 is an object of the class STACK and element is an integer to be pushed on to top of the stack.
   ii. s1=s1- ; where s1 is an object of the class STACK and – operator pops off the top element.

   Handle the STACK Empty and STACK Full conditions. Also display the contents of the stack after each operation, by overloading the operator <<.

8. Design, develop, and execute a program in C++ to create a class called LIST (linked list) with member functions to insert an element at the front of the list as well as to delete an element from the front of the list. Demonstrate all the functions after creating a list object.

9. Design, develop, and execute a program in C to read a sparse matrix of integer values and to search the sparse matrix for an element specified by the user. Print the result of the search appropriately. Use the triple <row, column, value> to represent an element in the sparse matrix.

10. Design, develop, and execute a program in C to create a max heap of integers by accepting one element at a time and by inserting it immediately in to the heap. Use the array representation for the heap. Display the array at the end of insertion phase.

11. Design, develop, and execute a program in C to implement a doubly linked list where each node consists of integers. The program should support the following operations:
    i. Create a doubly linked list by adding each node at the front.
    ii. Insert a new node to the left of the node whose key value is read as an input.
    iii. Delete the node of a given data if it is found, otherwise display appropriate message.
    iv. Display the contents of the list.
    (Note: Only either (a,b and d) or (a, c and d) may be asked in the examination)

12. Design, develop, and execute a program in C++ to create a class called DATE with methods to accept two valid dates in the form dd/mm/yy and to implement the following operations by overloading the operators + and -. After every operation the results are to be displayed by overloading the operator <<.
    i. no_of_days = d1 – d2; where d1 and d2 are DATE objects, d1 >=d2 and no_of_days is an integer.
    ii. d2 = d1 + no_of_days; where d1 is a DATE object and no_of_days is an integer.

13. Design, develop, and execute a program in C++ to create a class called OCTAL, which has the characteristics of an octal number. Implement the following operations by writing an appropriate constructor and an overloaded operator +.
    i. OCTAL h = x ; where x is an integer

ii. int y = h + k ; where h is an OCTAL object and k is an integer.
Display the OCTAL result by overloading the operator <<. Also display the values of h and y.

14. Design, develop, and execute a program in C++ to create a class called BIN_TREE that represents a Binary Tree, with member functions to perform inorder, preorder and postorder traversals. Create a BIN_TREE object and demonstrate the traversals.

Note: In the examination each student picks one question from a lot of *all* the 14 questions.

ELECTRONIC CIRCUITS & LOGIC DESIGN LABORATORY
(Common to CSE & ISE)

Subject Code: 10CSL38	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks : 50**

PART-A

1. a) Design and construct a suitable circuit and demonstrate the working of positive clipper, double-ended clipper and positive clamper using diodes.
   b) Demonstrate the working of the above circuits using a simulation package.

2. a) Design and construct a suitable circuit and determine the frequency response, input impedance, output impedance, and bandwidth of a CE amplifier.
   b) Design and build the CE amplifier circuit using a simulation package and determine the voltage gain for two different values of supply voltage and for two different values of emitter resistance.

3. a) Design and construct a suitable circuit and determine the drain characteristics and transconductance characteristics of an enhancement-mode MOSFET.
   b) Design and build CMOS inverter using a simulation package and verify its truth table.

4. a) Design and construct a Schmitt trigger using Op-Amp for given UTP and LTP values and demonstrate its working.
   b) Design and implement a Schmitt trigger using Op-Amp using a simulation package for two sets of UTP and LTP values and demonstrate its working.

5. a) Design and construct a rectangular waveform generator (Op-Amp relaxation oscillator) for given frequency and demonstrate its working.
   b) Design and implement a rectangular waveform generator (Op-Amp relaxation oscillator) using a simulation package and demonstrate the change in frequency when all resistor values are doubled.

6. Design and implement an astable multivibrator circuit using 555 timer for a given frequency and duty cycle.

PART – B

7. a) Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
   b) Design and develop the Verilog /VHDL code for an 8:1 multiplexer. Simulate and verify its working.

8. a) Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.
   b) Design and develop the Verilog / VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify its working.

9. a) Design and implement a mod-n (n<8) synchronous up counter using J-K Flip-Flop ICs and demonstrate its working.
   b) Design and develop the Verilog / VHDL code for mod-8 up counter. Simulate and verify its working.

10. a) Design and implement a ring counter using 4-bit shift register and demonstrate its working.
    b) Design and develop the Verilog / VHDL code for switched tail counter. Simulate and verify its working.

11. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate its working.

12. Design and construct a 4-bit R-2R ladder D/A converter using Op-Amp. Determine its accuracy and resolution.

Notes:

1. **In the examination, each student picks one question from the lot of questions, either from Part-A or from Part-B. About half the students in the batch are to get a question from Part-A while the rest are to get the question from Part-B.**
2. **Any simulation package like MultiSim / Pspice etc may be used.**

IV SEMESTER

ENGINEERING MATHEMATICS IV
(Common to CSE & ISE)

Subject Code: 10MAT41	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Numerical Methods: Numerical solutions of first order and first degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge – Kutta method of fourth order, Milne's and Adams-Bashforth predictor and corrector methods (All formulae without Proof).

UNIT – 2 **7 Hours**

Complex Variables: Function of a complex variable, Limit, Continuity Differentiability – Definitions. Analytic functions, Cauchy – Riemann equations in cartesian and polar forms, Properties of analytic functions. Conformal Transformation – Definition

Discussion of transformations: $W = z^2$, $W = e^z$, $W = z + (I/z)$, $z \neq 0$ Bilinear transformations.

UNIT – 3 **6 Hours**

Complex Integration: Complex line integrals, Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only) Singularities, Poles, Residues, Cauchy's residue theorem (statement only)

UNIT – 4 **7 Hours**

Series solution of Ordinary Differential Equations and Special Functions: Series solution – Frobenius method, Series solution of Bessel's D.E. leading to Bessel function of fist kind. Equations reducible to Bessel's D.E., Series solution of Legendre's D.E. leading to Legendre Polynomials. Rodirgue's formula

PART – B

UNIT - 5 **6 Hours**

Statistical Methods

Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ax^b$ $y = ab^x$, $y = ae^{bx}$, Correlation and Regression.

Probability: Addition rule, Conditional probability, Multiplication rule, Baye's theorem.

UNIT – 6 **7 Hours**

Random Variables (Discrete and Continuous) p.d.f., c.d.f. Binomial, Poisson, Normal and Exponential distributions.

UNIT - 7 **7 Hours**

Sampling, Sampling distribution, Standard error. Testing of hypothesis for means. Confidence limits for means, Student's t distribution, Chi-square distribution as a test of goodness of fit.

UNIT - 8 **6 Hours**

Concept of joint probability – Joint probability distribution, Discrete and Independent random variables, Expectation, Covariance, Correlation coefficient

Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states

Text Book:

1. B.S. Grewal: Higher Engineering Mathematics, 40th Edition, Khanna Publishers, 2007
   (Chapters: 31.1, 31.3 to 31.5, 31.7 to 31.8, 20.1 to 20.20.10, 20.12 to 20.14, 20.16 to 20.19, 16.1 to 16.6, 16.10, 16.13 to 16.14, 24.4 to 24.6, 25.12 to 25.14, 26.1 to 26.6, 26.7 to 26.10, 26.14 to 26.16, 27.1 to 27.6, 27.14, 27.17 to 27.18)
2. Seymour Lipschutz: Probability, Schaum's series, McGraw Hill.

(Chapters: 5 & 7)

Reference Books:

1. B.V. Ramana: Higher Engineering Mathematics, Tata McGraw Hill, 2006.
2. Glyn James: Advanced Modern Engineering Mathematics, 3rd Edition, Pearson Education, 2003.

GRAPH THEORY AND COMBINATORICS
(Common to CSE & ISE)

Subject Code: 10CS42	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 7 Hours

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits

UNIT - 2 6 Hours

Introduction to Graph Theory *contd*.: Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials

UNIT - 3 6 Hours

Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes

UNIT - 4 7 Hours

Optimization and Matching: Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees – The algorithms of Kruskal and Prim, Transport Networks – Max-flow, Min-cut Theorem, Matching Theory

PART – B

UNIT - 5 6 Hours

Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition, The Catalon Numbers

UNIT - 6 6 Hours

The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials

UNIT - 7 7 Hours

Generating Functions: Introductory Examples, Definition and Examples – Calculational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator

UNIT - 8 7 Hours

Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients, The Non-homogeneous Recurrence Relation, The Method of Generating Functions

Text Book:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004. (Chapter 11, Chapter 12.1 to 12.4, Chapter 13, Chapter 1, Chapter 8.1 to 8.4, Chapter 9 Chapter 10.1 to 10.4).

Reference Books:

1. D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2005.
2. Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
3. Richard A. Brualdi: Introductory Combinatorics, 4th Edition, Pearson Education, 2004.
4. Geir Agnarsson & Raymond Geenlaw: Graph Theory Modeling, Applications, and Algorithms, Pearson Education, 2007.

DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE & ISE)

Subject Code: 10CS43 | **I.A. Marks : 25**
Hours/Week : 04 | **Exam Hours: 03**
Total Hours : 52 | **Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**
INTRODUCTION: Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms
Brute Force Approaches: Introduction, Selection Sort and Bubble Sort, Sequential Search and Brute Force String Matching.

UNIT - 2 **6 Hours**
DIVIDE AND CONQUER: Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort and its performance.

UNIT - 3 **7 Hours**
THE GREEDY METHOD: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Job Sequencing with Deadlines, Kruskal's Algorithm; Single Source Shortest Paths.

UNIT - 4 **6 Hours**
DYNAMIC PROGRAMMING: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths: General Weights, 0/1 Knapsack, The Traveling Salesperson problem.

PART – B

UNIT - 5 **7 Hours**
DECREASE-AND-CONQUER APPROACHES, SPACE-TIME TRADEOFFS: Decrease-and-Conquer Approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting
Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching.

UNIT – 6 **7 Hours**
LIMITATIONS OF ALGORITHMIC POWER AND COPING WITH THEM: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms.

UNIT - 7 **6 Hours**
COPING WITH LIMITATIONS OF ALGORITHMIC POWER: Backtracking: n - Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem.
Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesperson Problem.
Approximation Algorithms for NP-Hard Problems – Traveling Salesperson Problem, Knapsack Problem

UNIT – 8 **6 Hours**
PRAM ALGORITHMS: Introduction, Computational Model, Parallel Algorithms for Prefix Computation, List Ranking, and Graph Problems,

Text Books:

1. Anany Levitin: Introduction to The Design & Analysis of Algorithms, 2nd Edition, Pearson Education, 2007.
   (Listed topics only from the Chapters 1, 2, 3, 5, 7, 8, 10, 11).
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Fundamentals of Computer Algorithms, 2nd Edition, University press, 2007.
   (Listed topics only from the Chapters 3, 4, 5, 13)

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 2nd Edition, PHI, 2006.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai: Introduction to the Design and Analysis of Algorithms A Strategic Approach, Tata McGraw Hill, 2005.

UNIX AND SHELL PROGRAMMING
(Common to CSE & ISE)

Subject Code: 10CS44 | **I.A. Marks : 25**
Hours/Week : 04 | **Exam Hours: 03**

Total Hours : 52 **Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
The Unix Operating System, The UNIX architecture and Command Usage, The File System

UNIT - 2 **6 Hours**
Basic File Attributes, the vi Editor

UNIT - 3 **7 Hours**
The Shell, The Process, Customizing the environment

UNIT - 4 **7 Hours**
More file attributes, Simple filters

PART – B

UNIT - 5 **6 Hours**
Filters using regular expressions,

UNIT - 6 **6 Hours**
Essential Shell Programming

UNIT - 7 **7 Hours**
awk – An Advanced Filter

UNIT - 8 **7 Hours**
perl - The Master Manipulator

Text Book:

1. Sumitabha Das: UNIX – Concepts and Applications, 4^{th} Edition, Tata McGraw Hill, 2006. (Chapters 1.2, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 18, 19)

Reference Books:

1. Behrouz A. Forouzan and Richard F. Gilberg: UNIX and Shell Programming**,** Thomson, 2005.
2. M.G. Venkateshmurthy: UNIX & Shell Programming**,** Pearson Education, 2005.

MICROPROCESSORS
(Common to CSE & ISE)

Subject Code: 10CS45	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART A

UNIT – 1 **7 Hours**
Introduction, Microprocessor Architecture – 1: A Historical Background, The Microprocessor-Based Personal Computer Systems.
The Microprocessor and its Architecture: Internal Microprocessor Architecture, Real Mode Memory Addressing.

UNIT – 2 **7 Hours**
Microprocessor Architecture – 2, Addressing Modes: Introduction to Protected Mode Memory Addressing, Memory Paging, Flat Mode Memory
Addressing Modes: Data Addressing Modes, Program Memory Addressing Modes, Stack Memory Addressing Modes

UNIT – 3 **6 Hours**
Programming – 1: Data Movement Instructions: MOV Revisited, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Segment Override Prefix, Assembler Details.
Arithmetic and Logic Instructions: Addition, Subtraction and Comparison, Multiplication and Division.

UNIT - 4 **6 Hours**
Programming – 2: Arithmetic and Logic Instructions (continued): BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons.

Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Procedures, Introduction to Interrupts, Machine Control and Miscellaneous Instructions.

PART B

UNIT - 5 **6 Hours**

Programming – 3: Combining Assembly Language with C/C++: Using Assembly Language with C/C++ for 16-Bit DOS Applications and 32-Bit Applications

Modular Programming, Using the Keyboard and Video Display, Data Conversions, Example Programs

UNIT - 6 **7 Hours**

Hardware Specifications, Memory Interface – 1: Pin-Outs and the Pin Functions, Clock Generator, Bus Buffering and Latching, Bus Timings, Ready and Wait State, Minimum versus Maximum Mode.

Memory Interfacing: Memory Devices

UNIT – 7 **6 Hours**

Memory Interface – 2, I/O Interface – 1: Memory Interfacing (continued): Address Decoding, 8088 Memory Interface, 8086 Memory Interface.

Basic I/O Interface: Introduction to I/O Interface, I/O Port Address Decoding.

UNIT 8 **7 Hours**

I/O Interface – 2, Interrupts, and DMA: I/O Interface (continued): The Programmable Peripheral Interface 82C55, Programmable Interval Timer 8254.

Interrupts: Basic Interrupt Processing, Hardware Interrupts: INTR and INTA/; Direct Memory Access: Basic DMA Operation and Definition.

Text Book:

1. Barry B Brey: The Intel Microprocessors, 8^{th} Edition, Pearson Education, 2009.
   (Listed topics only from the Chapters 1 to 13)

Reference Books:

1. Douglas V. Hall: Microprocessors and Interfacing, Revised 2^{nd} Edition, TMH, 2006.
2. K. Udaya Kumar & B.S. Umashankar : Advanced Microprocessors & IBM-PC Assembly Language Programming, TMH 2003.
3. James L. Antonakos: The Intel Microprocessor Family: Hardware and Software Principles and Applications, Thomson, 2007.

COMPUTER ORGANIZATION
(Common to CSE & ISE)

Subject Code: 10CS46	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT - 1 **6 Hours**
Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective
Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing,

UNIT - 2 **7 Hours**
Machine Instructions and Programs *contd.*: Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions

UNIT - 3 **6 Hours**
Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses

UNIT - 4 **7 Hours**
Input/Output Organization *contd.*: Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB

PART – B

UNIT - 5 **7 Hours**
Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage

UNIT - 6 **7 Hours**
Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations

UNIT - 7 **6 Hours**
Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Microprogrammed Control

UNIT - 8 **6 Hours**
Multicores, Multiprocessors, and Clusters: Performance, The Power Wall, The Switch from Uniprocessors to Multiprocessors, Amdahl's Law, Shared Memory Multiprocessors, Clusters and other Message Passing Multiprocessors, Hardware Multithreading, SISD, IMD, SIMD, SPMD, and Vector.

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
   (Listed topics only from Chapters 1, 2, 4, 5, 6, 7)
2. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.

Reference Books:

1. William Stallings: Computer Organization & Architecture, 7th Edition, PHI, 2006.
2. Vincent P. Heuring & Harry F. Jordan: Computer Systems Design and Architecture, 2nd Edition, Pearson Education, 2004.

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY
(Common to CSE & ISE)

Subject Code: 10CSL47 | **I.A. Marks : 25**
Hours/Week : 03 | **Exam Hours: 03**
Total Hours : 42 | **Exam Marks: 50**

Design, develop and implement the specified algorithms for the following problems using C/C++ Language in LINUX / Windows environment.

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
   The elements can be read from a file or can be generated using the random number generator.

2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

3. a. Obtain the Topological ordering of vertices in a given digraph.
   b. Compute the transitive closure of a given directed graph using Warshall's algorithm.

4. Implement 0/1 Knapsack problem using Dynamic Programming.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

7. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
   b. Check whether a given graph is connected or not using DFS method.

8. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

12. Implement N Queen's problem using Back Tracking.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

MICROPROCESSORS LABORATORY
(Common to CSE & ISE)

Subject Code : 10CSL48	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

Notes:

- **Develop and execute the following programs using 8086 Assembly Language. Any suitable assembler like MASM, TASM etc may be used.**
- **Program should have suitable comments.**
- **The board layout and the circuit diagram of the interface are to be provided to the student during the examination.**

1. a) Search a key element in a list of 'n' 16-bit numbers using the Binary search algorithm.
   b) Read the status of eight input bits from the Logic Controller Interface and display 'FF' if it is the parity of the input read is even; otherwise display 00.

2. a) Write two ALP modules stored in two different files; one module is to read a character from the keyboard and the other one is to display a character. Use the above two modules to read a string of characters from the keyboard terminated by the carriage return and print the string on the display in the next line.
   b) Implement a BCD Up-Down Counter on the Logic Controller Interface.

3. a) Sort a given set of 'n' numbers in ascending order using the Bubble Sort algorithm.
   b) Read the status of two 8-bit inputs (X & Y) from the Logic Controller Interface and display X*Y.

4. a) Read an alphanumeric character and display its equivalent ASCII code at the center of the screen.
   b) Display messages FIRE and HELP alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

5. a) Reverse a given string and check whether it is a palindrome or not.
   b) Assume any suitable message of 12 characters length and display it in the rolling fashion on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages. (Examiner does not specify these delay values nor is it necessary for the student to compute these values).
6. a) Read two strings, store them in locations STR1 and STR2. Check whether they are equal or not and display appropriate messages. Also display the length of the stored strings.
   b) Convert a 16-bit binary value (assumed to be an unsigned integer) to BCD and display it from left to right and right to left for specified number of times on a 7-segment display interface.

7. a) Read your name from the keyboard and display it at a specified location on the screen after the message "**What is your name?"** You must clear the entire screen before display.
   b) Scan a 8 x 3 keypad for key closure and to store the code of the key pressed in a memory location or display on screen. Also display row and column numbers of the key pressed.

8. a) Compute **nCr** using recursive procedure. Assume that 'n' and 'r' are non-negative integers.
   b) Drive a Stepper Motor interface to rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).

9. a) Read the current time from the system and display it in the standard format on the screen.
   b) Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).

10. a) Write a program to simulate a Decimal Up-counter to display 00-99.
    b) Generate a Half Rectified Sine wave form using the DAC interface. (The output of the DAC is to be displayed on the CRO).

11. a) Read a pair of input co-ordinates in BCD and move the cursor to the specified location on the screen.
    b) Generate a Fully Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).

12. a) Write a program to create a file (input file) and to delete an existing file.
    b) Drive an elevator interface in the following way:
       i. Initially the elevator should be in the ground floor, with all requests in OFF state.
       ii. When a request is made from a floor, the elevator should move to that floor, wait there for a couple of seconds (approximately), and then come down to ground floor and stop. If some requests occur during going up or coming down they should be ignored.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

V SEMESTER

SOFTWARE ENGINEERING

Subject Code: 10IS51	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility.
Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems.

UNIT – 2 **6 Hours**
Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.
Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

UNIT – 3 **7 Hours**
Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document.
Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

UNIT – 4 **7 Hours**
System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods.
Project Management: Management activities; Project planning; Project scheduling; Risk management.

PART - B

UNIT – 5 **7 Hours**
Software Design : Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.
Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT – 6 **6 Hours**
Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.

UNIT – 7 **7 Hours**
Verification and Validation: Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods.
Software testing: System testing; Component testing; Test case design; Test automation.

UNIT – 8 **6 Hours**

Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model.

Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Books:

1. Ian Sommerville: Software Engineering, 8th Edition, Pearson Education, 2007.
   (Chapters-: 1, 2, 3, 4, 5, 6, 7, 8, 11, 14, 17, 21, 22, 23, 25, 26)

Reference Books:

1. Roger.S.Pressman: Software Engineering-A Practitioners approach, 7th Edition, McGraw Hill, 2007.
2. Pankaj Jalote: An Integrated Approach to Software Engineering, 3rd Edition, Narosa Publishing House, 2005.

SYSTEM SOFTWARE

Subject Code: 10CS52	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Machine Architecture: Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

UNIT – 2 **6 Hours**

Assemblers -1: Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation.

UNIT – 3 **6 Hours**

Assemblers -2: Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.

UNIT – 4 **8 Hours**

Loaders and Linkers: Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader; Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker.

PART – B

UNIT – 5 **6 Hours**

Editors and Debugging Systems: Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities, Relationship With Other Parts Of The System, User-Interface Criteria

UNIT – 6 **8 Hours**

Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

UNIT – 7 **6 Hours**

Lex and Yacc – 1: Lex and Yacc - The Simplest Lex Program, Recognizing Words With LEX, Symbol Tables, Grammars, Parser-Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Parsing a Command Line.

UNIT – 8 **6 Hours**

Lex and Yacc - 2

Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity, Variables and Typed Tokens.

Text Books:

1. Leland.L.Beck: System Software, 3rd Edition, Addison-Wesley, 1997.
   (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3))
2. John.R.Levine, Tony Mason and Doug Brown: Lex and Yacc, O'Reilly, SPD, 1998.
   (Chapters 1, 2 (Page 2-42), 3 (Page 51-65))

Reference Books:

1. D.M.Dhamdhere: System Programming and Operating Systems, 2nd Edition, Tata McGraw - Hill, 1999.

OPERATING SYSTEMS

Subject Code: 10CS53	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special-purpose systems; Computing environments.Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

UNIT – 2 **7 Hours**

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling.

UNIT – 3 **7 Hours**

Process Synchronization : Synchronization: The Critical section problem; Peterson’s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

UNIT – 4 **6 Hours**

Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

PART – B

UNIT – 5 **7 Hours**

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

UNIT – 6 **7 Hours**

File System, Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management

UNIT – 7 **6 Hours**

Secondary Storage Structures, Protection : Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems.

UNIT – 8 **6 Hours**

Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 7th edition, Wiley India, 2006.
   (Chapters: 1, 2, 3.1 to 3.4 , 4.1 to 4.4, 5.1 to 5.5, 6.1 to 6.7, 7, 8.1 to 8.6, 9.1 to 9.6, 10, 11.1 to 11.5, 12.1 to 12.6, 17.1 to 17.8, 21.1 to 21.9)

Reference Books:

1. D.M Dhamdhere: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.
2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006.
3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 1990.

DATABASE MANAGEMENT SYSTEMS

Subject Code: 10CS54	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS.
Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

UNIT – 2 **6 Hours**
Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

UNIT – 3 **8 Hours**
Relational Model and Relational Algebra : Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping.

UNIT – 4 **6 Hours**
SQL – 1: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.

PART - B

UNIT – 5 **6 Hours**
SQL – 2: Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL; Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

UNIT – 6 **6 Hours**
Database Design – 1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

UNIT – 7 **6 Hours**
Database Design -2: Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms

UNIT – 8 **8 Hours**

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007. (Chapters 1, 2, 3 except 3.8, 5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10)
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
   (Chapters 16, 17.1, 17.2, 18)

Reference Books:

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, 8th Edition, Pearson education, 2006.

COMPUTER NETWORKS - I

Subject Code: 10CS55	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **8 Hours**

Communication Networks and Services, Applications and Layered Architectures : Evolution of Network Architecture and Services; Future network architectures and their services; Key factors in communication network evolution

Examples of Protocols, Services, and Layering; The OSI Reference Model; Overview of TCP/IP Architecture; Application Layer Protocols and TCP/IP Utilities.

UNIT – 2 **6 Hours**

Digital Transmission – 1: Digital Representation of Information: Block-Oriented Information, Stream Information; Why Digital Communications? Comparison of Analog and Digital Transmission , Basic properties of Digital Transmission Systems; Digital Representation of Analog Signals: Bandwidth of Analog Signals, Sampling of an Analog Signal, Digital Transmission of Analog Signals; Characterization of Communication Channels: Frequency Domain Characterization, Time Domain Characterization; Fundamental Limits in Digital Transmission: The Nyquist Signaling Rate, The Shannon Channel Capacity; Line Coding.

UNIT – 3 **6 Hours**

Digital Transmission – 2: Modems and Digital Modulation: Binary Phase Modulation, QAM and Signal Constellations, Telephone Modem Standards; Properties of Media and Digital Transmission Systems: Twisted Pair, Coaxial Cable, Optical Fiber, Radio Transmission, Infrared Light; Error Detection and Correction: Error Detection, Two Dimensional Parity Checks, Internet Checksum, Polynomial Codes, Standardized Polynomial Codes, Error Detecting Capability of a Polynomial Code.

UNIT – 4 **6 Hours**

Circuit Switching Networks: Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Wavelength-Division Multiplexing; SONET: SONET Multiplexing, SONET Frame Structure; Transport Networks: SONET Networks, Optical Transport networks; Circuit Switches: Space Division Switches, Time Division Switches; The Telephone Network: Transmission Facilities, End to End Digital Services; Cellular telephone networks.

PART - B

UNIT – 5 **6 Hours**

Peer-to-Peer Protocols and Data Link Layer - I : Peer-to-Peer Protocols and Service Models: Service models, Examples of services, End to end versus hop by hop; ARQ Protocols and Reliable Data Transfer Service: Stop-and-Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ; Other Peer-to-Peer Protocols: Sliding-window flow control, Timing recovery for synchronous services, TCP reliable stream service and flow control.

UNIT – 6 **6 Hours**

Peer-to-Peer Protocols and Data Link Layer – II: Data Link Controls: Framing; Point to Point Protocol; HDLC Data link Control: Data link services, HDLC configuration and transfer modes, HDLC frame format, Typical frame exchanges; Link Sharing using Packet Multiplexers: Statistical Multiplexing, Speech Interpolation and the Multiplexing of Packetized Speech.

UNIT – 7 **7 Hours**
Medium Access Control Protocols and Local Area Networks – I: The Medium Access Control Protocols: Multiple Access Communications; Random Access : ALOHA, Slotted ALOHA, CSMA, CSMA-CD; Scheduling Approaches to Medium Access Control: Reservation Systems, Polling, Token-Passing Rings, Comparison of scheduling approaches in MAC, Comparison of random access and scheduling MAC; Channelization: FDMA, TDMA, CDMA.

UNIT – 8 **7 Hours**
Medium Access Control Protocols and Local Area Networks – II : LAN Protocols: LAN Structure , The Medium Access Control Sublayer, The Logical Link Control Sublayer; Ethernet and IEEE 802.3 LAN Standard: Ethernet Protocol, Frame structure, Physical Layers, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet; Token Ring and IEEE 802.5 LAN Standard: Token-Ring Protocol, Frame structure; FDDI; Wireless LANs and IEEE 802.11 Standard: Ad hoc and Infrastructure Networks, Frame structure and addressing, Medium Access Control; LAN Bridges and Ethernet Switches: Transparent Bridges, Source Routing Bridges, Mixed-Media Bridges, Virtual LANs.

Text Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
   (Chapters 1, 2.1 to 2.3, 2.5, 3.1 to 3.9 except 3.3.4, 3.9.7 and 3.9.8 , 4.1 to 4.5, 4.8, 5, 6.1 to 6.4, 6 except 6.10.4)

References:

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

FORMAL LANGUAGES AND AUTOMATA THEORY

Subject Code: 10CS56	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**
Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata

UNIT – 2 **7 Hours**
Finite Automata, Regular Expressions: An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions

UNIT – 3 **6 Hours**
Regular Languages, Properties of Regular Languages: Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata

UNIT – 4 **6 Hours**
Context-Free Grammars And Languages : Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Languages .

PART – B

UNIT – 5 **7 Hours**
Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata

UNIT – 6 **6 Hours**

Properties of Context-Free Languages: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs

UNIT – 7 **7 Hours**

Introduction To Turing Machine: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.

UNIT – 8 **6 Hours**

Undecidability: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; Other undecidable problems.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2007.
   (Chapters: 1.1, 1.5, 2.2 to 2.5, 3.1 to 3.3, 4, 5, 6, 7, 8.1 to 8.4, 8.6, 9.1, 9.2, 9.4.1, 9.5)

Reference Books:

1. K.L.P. Mishra: Theory of Computer Science, Automata, Languages, and Computation, 3rd Edition, PHI, 2007.
2. Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
3. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education, 2006.

DATABASE APPLICATIONS LABORATORY

Subject Code: 10CSL57	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Consider the following relations:
   Student (*snum:* integer, *sname:* string, *major:* string, *level:* string, *age:* integer)
   Class (*name:* string, *meets at:* string, *room:* string, *d:* integer)
   Enrolled (*snum:* integer, *cname:* string)
   Faculty (fi*d*: integer, *fname:* string, *deptid:* integer)
   The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)
   Write the following queries in SQL. No duplicates should be printed in any of the answers.
   i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
   ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
   iii. Find the names of all students who are enrolled in two classes that meet at the same time.
   iv. Find the names of faculty members who teach in every room in which some class is taught.
   v. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.

2. The following relations keep track of airline flight information:
   Flights (*no:* integer, *from:* string, *to:* string, *distance:* integer, *Departs:* time, *arrives:* time, *price:* real)
   Aircraft (*aid:* integer, *aname:* string, *cruisingrange:* integer)
   Certified (*eid:* integer, *aid:* integer)
   Employees (*eid:* integer, *ename:* string, *salary:* integer)
   Note that the Employees relation describes pilots and other kinds of employees as well; Every pilot is certified for some aircraft, and only pilots are certified to fly.
   Write each of the following queries in SQL.

   i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.
   ii. For each pilot who is certified for more than three aircrafts, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
   iii. Find the names of pilots whose *salary* is less than the price of the cheapest route from Bengaluru to Frankfurt.
   iv. For all aircraft with *cruisingrange* over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for this aircraft.

v. Find the names of pilots certified for some Boeing aircraft.
vi. Find the *aid*s of all aircraft that can be used on routes from Bengaluru to New Delhi.

3. Consider the following database of student enrollment in courses & books adopted for each course.
STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course #:int, cname:string, dept:string)
ENROLL (regno:string, course#:int, sem:int, marks:int)
BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)
   i. Create the above tables by properly specifying the primary keys and the foreign keys.
   ii. Enter at least five tuples for each relation.
   iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.
   iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department that use more than two books.
   v. List any department that has *all* its adopted books published by a specific publisher.
   vi. Generate suitable reports.
   vii. Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.
AUTHOR (author-id:int, name:string, city:string, country:string)
PUBLISHER (publisher-id:int, name:string, city:string, country:string)
CATALOG (book-id:int, title:string, author-id:int, publisher-id:int, category-id:int, year:int, price:int)
CATEGORY (category-id:int, description:string)
ORDER-DETAILS (order-no:int, book-id:int, quantity:int)
   i. Create the above tables by properly specifying the primary keys and the foreign keys.
   ii. Enter at least five tuples for each relation.
   iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
   iv. Find the author of the book which has maximum sales.
   v. Demonstrate how you increase the price of books published by a specific publisher by 10%.
   vi. Generate suitable reports.
   vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise
BRANCH(branch-name:string, branch-city:string, assets:real)
ACCOUNT(accno:int, branch-name:string, balance:real)
DEPOSITOR(customer-name:string, accno:int)
CUSTOMER(customer-name:string, customer-street:string, customer-city:string)
LOAN(loan-number:int, branch-name:string, amount:real)
BORROWER(customer-name:string, loan-number:int)
   i. Create the above tables by properly specifying the primary keys and the foreign keys
   ii. Enter at least five tuples for each relation
   iii. Find all the customers who have at least two accounts at the *Main* branch.
   iv. Find all the customers who have an account at *all* the branches located in a specific city.
   v. Demonstrate how you delete all account tuples at every branch located in a specific city.
   vi. Generate suitable reports.
   vii. Create suitable front end for querying and displaying the results.

Instructions:

1. The exercises are to be solved in an RDBMS environment like Oracle or DB2.
2. Suitable tuples have to be entered so that queries are executed correctly.
3. Front end may be created using either VB or VAJ or any other similar tool.
4. The student need not create the front end in the examination. The results of the queries may be displayed directly.
5. Relevant queries other than the ones listed along with the exercises may also be asked in the examination.
6. Questions must be asked based on lots.

SYSTEM SOFTWARE & OPERATING SYSTEMS LABORATORY

Subject Code: 10CSL58	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

PART - A

LEX and YACC Programs:

Design, develop, and execute the following programs using LEX:

1. a) Program to count the number of characters, words, spaces and lines in a given input file.
   b) Program to count the numbers of comment lines in a given C program. Also eliminate them and copy the resulting program into separate file.

2. a) Program to recognize a valid arithmetic expression and to recognize the identifiers and operators present. Print them separately.
   b) Program to recognize whether a given sentence is simple or compound.

3. Program to recognize and count the number of identifiers in a given input file.

Design, develop, and execute the following programs using YACC:

4. a) Program to recognize a valid arithmetic expression that uses operators +, -, * and /.
   b) Program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.

5. a) Program to evaluate an arithmetic expression involving operators +, -, * and /.
   b) Program to recognize strings 'aaab', 'abbb', 'ab' and 'a' using the grammar (a^nb^n, n>= 0).

6. Program to recognize the grammar (a^nb, n>= 10).

PART B

UNIX Programming:

Design, develop, and execute the following programs:

7. a) Non-recursive shell script that accepts any number of arguments and prints them in the Reverse order, (For example, if the script is named rargs, then executing rargs A B C should produce C B A on the standard output).
   b) C program that creates a child process to read commands from the standard input and execute them (a minimal implementation of a shell – like program). You can assume that no arguments will be passed to the commands to be executed.

8. a) Shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, outputs the common permissions, otherwise outputs each file name followed by its permissions.
   b) C program to create a file with 16 bytes of arbitrary data from the beginning and another 16 bytes of arbitrary data from an offset of 48. Display the file contents to demonstrate how the hole in file is handled.

9. a) Shell script that accepts file names specified as arguments and creates a shell script that contains this file as well as the code to recreate these files. Thus if the script generated by your script is executed, it would recreate the original files(This is same as the "bundle" script described by Brain W. Kernighan and Rob Pike in " The Unix Programming Environment", Prentice – Hall India).
   b) C program to do the following: Using fork( ) create a child process. The child process prints its own process-id and id of its parent and then exits. The parent process waits for its child to finish (by executing the wait( )) and prints its own process-id and the id of its child process and then exits.

Operating Systems:

10. Design, develop and execute a program in C / C++ to simulate the working of Shortest Remaining Time and Round-Robin Scheduling Algorithms. Experiment with different quantum sizes for the Round-Robin algorithm. In all cases, determine the average turn-around time. The input can be read from key board or from a file.
11. Using OpenMP, Design, develop and run a multi-threaded program to generate and print Fibonacci Series. One thread has to generate the numbers up to the specified limit and another thread has to print them. Ensure proper synchronization.
12. Design, develop and run a program to implement the Banker's Algorithm. Demonstrate its working with different data values.

Instructions:

In the examination, a combination of one LEX and one YACC problem has to be asked from Part A for a total of 30 marks and one programming exercise from Part B has to be asked for a total of 20 marks.

VI SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP
(Common to All Branches)

Subject Code: 10AL61	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIX SYSTEMS PROGRAMMING

Subject Code: 10CS62	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards.
UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

UNIT – 2 **6 Hours**

UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIT – 3 **7 Hours**

UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

UNIT – 4 **7 Hours**

UNIX Processes: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

PART - B

UNIT – 5 **7 Hours**

Process Control : Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection.
Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

UNIT – 6 **7 Hours**

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.
Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

UNIT – 7 **6 Hours**

Interprocess Communication – 1: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.

UNIT – 8 **6 Hours**

Interprocess Communication – 2: Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Text Books:

1. Terrence Chan: UNIX System Programming Using C++, Prentice Hall India, 1999.
   (Chapters 1, 5, 6, 7, 8, 9, 10)
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005.
   (Chapters 7, 8, 9, 13, 14, 15)

Reference Books:

1. Marc J. Rochkind: Advanced UNIX Programming, 2nd Edition, Pearson Education, 2005.
2. Maurice J Bach: The Design of the UNIX Operating System, Pearson Education, 1987.
3. Uresh Vahalia: UNIX Internals, Pearson Education, 2001.

FILE STRUCTURES

Subject Code: 10IS63	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; Storage as Hierarchy, A journey of a Byte, Buffer Management, Input /Output in UNIX.

UNIT – 2 **6 Hours**

Fundamental File Structure Concepts, Managing Files of Records : Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.

UNIT – 3 **7 Hours**

Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Keysorting; What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.

UNIT – 4 **6 Hours**

Cosequential Processing and the Sorting of Large Files: A Model for Implementing Cosequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Mutiway Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk.

PART - B

UNIT – 5 **7 Hours**

Multi-Level Indexing and B-Trees: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.

UNIT – 6 **6 Hours**

Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.

UNIT – 7 **7 Hours**

Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access.

UNIT – 8 **6 Hours**
Extendible Hashing: How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.

Text Books:
1. Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Addison-Wesley, 1998.
   (Chapters 1 to 12 excluding 1.4, 1.5, 5.5, 5.6, 8.6, 8.7, 8.8)

Reference Books:
1. K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008.
2. Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993.
3. Raghu Ramakrishan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw Hill, 2003.

COMPUTER NETWORKS - II

Subject Code: 10CS64	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**
Packet-Switching Networks – 1: Network services and internal network operations; Packet network topology; Datagrams and virtual circuits; Routing in packet networks; Shortest-path routing; ATM networks

UNIT – 2 **6 Hours**
Packet-Switching Networks – 2, TCP / IP – 1: Traffic management at the packet level; Traffic management at the flow level; Traffic management at the flow-aggregate level
The TCP / IP architecture; The Internet protocol

UNIT – 3 **7 Hours**
TCP / IP – 2: IPv6; User datagram protocol; Transmission control protocol; Internet routing protocols; Multicast routing; DHCP, NAT, and Mobile IP

UNIT – 4 **7 Hours**
ATM Networks: Why ATM? BISDN reference model; ATM layer; ATM adaptation layer; ATM signaling; PNNI routing; Classical IP over ATM

PART – B

UNIT – 5 **6 Hours**
Network Management, Security: Network management overview; SNMP; Structure of Management information; MIB; Remote network monitoring
Security and cryptographic algorithms; Security protocols; Cryptographic algorithms

UNIT – 6 **7 Hours**
QoS, Resource Allocation, VPNs, Tunneling, Overlay Networks: Overview of QOS; Integrated services QoS; Differentiated services QoS; Resource allocation.
Virtual Private Networks; Multiprotocol Label switching; Overlay networks

UNIT – 7 **7 Hours**

Compression of Digital Voice and Video, VoIP, Multimedia Networking: Overview of data compression; Digital voice and compression; Still images and JPEG compression; Moving images and MPEG compression; Limits of compression with loss; Compression methods without loss; Case Study: FAX compression for transmission.
Overview of IP telephony; VoIP signaling protocols; Real-Time media transport protocols; Distributed multimedia networking; SCTP

UNIT – 8 **6 Hours**
Mobile Ad-Hoc Networks, Wireless sensor Networks: Overview of wireless adhoc networks; Routing in adhoc networks; Routing protocols for adhoc networks; security of adhoc networks. Sensor networks and protocol structures; Communication energy model; Clustering protocols; Routing protocols; Zigbee technology and IEEE 802.15.4

Text Books:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks – Fundamental Concepts and Key architectures, 2nd Edition, Tata McGraw-Hill, 2004.
   (Chapters 7, 8, 9, 11, Appendix B)
2. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.
   (Chapters 12, 16, 17, 18, 19, 20)

Reference Books:

1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

SOFTWARE TESTING

Subject Code: 10IS65	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT 2 **7 Hours**
Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations.

UNIT 3 **7 Hours**
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, Guidelines and observations.

UNIT 4 **6 Hours**
Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations.

PART – B

UNIT 5 **7 Hours**
System Testing, Interaction Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.

UNIT 6 **7 Hours**
Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors.

UNIT 7 **6 Hours**
Fault-Based Testing, Test Execution: Overview, Assumptions in fault-based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. Test Execution: Overview, from test case specifications to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay.

UNIT 8 **6 Hours**
Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

TEXT BOOKS:
1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008.
   (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 1314, 15)
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2008.
   (Listed topics only from Chapters 2, 3, 4, 16, 17, 20, 24)

REFERENCE BOOKS:
1. Aditya P Mathur**:** Foundations of Software Testing, Pearson, 2008.
2. Srinivasan Desikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 2nd Edition, Pearson, 2007.
3. Brian Marrick: The Craft of Software Testing, Pearson, 1995.

OPERATIONS RESEARCH

Subject Code: 10IS661/10CS661	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**
Introduction, Linear Programming – 1: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation .
Introduction to Linear Programming: Prototype example; The linear programming (LP) model.

UNIT – 2 **7 Hours**
LP – 2, Simplex Method – 1: Assumptions of LP; Additional examples.
The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method

UNIT – 3 **6 Hours**
Simplex Method – 2: Adapting to other model forms; Post optimality analysis; Computer implementation
Foundation of the simplex method.

UNIT – 4 **7 Hours**
Simplex Method – 2, Duality Theory: The revised simplex method, a fundamental insight.
The essence of duality theory; Economic interpretation of duality, Primal dual relationship; Adapting to other primal forms

PART - B

UNIT – 5 **7 Hours**
Duality Theory and Sensitivity Analysis, Other Algorithms for LP : The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis. The dual simplex method; Parametric linear programming; The upper bound technique.

UNIT – 6 **7 Hours**
Transportation and Assignment Problems: The transportation problem; A streamlined simplex method for the transportation problem; The assignment problem; A special algorithm for the assignment problem.

UNIT – 7 **6 Hours**
Game Theory, Decision Analysis: Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure; Solving by linear programming, Extensions.
Decision Analysis: A prototype example; Decision making without experimentation; Decision making with experimentation; Decision trees.

UNIT – 8 **6 Hours**
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.

Text Books:

1. Frederick S. Hillier and Gerald J. Lieberman: Introduction to Operations Research, 8th Edition, Tata McGraw Hill, 2005.
   (Chapters: 1, 2, 3.1 to 3.4, 4.1 to 4.8, 5, 6.1 to 6.7, 7.1 to 7.3, 8, 13, 14, 15.1 to 15.4)

Reference Books:

1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.
2. Hamdy A Taha: Operations Research: An Introduction, 8th Edition, Prentice Hall India, 2007.

COMPILER DESIGN

Subject Code: 10IS662/10CS63	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Introduction, Lexical analysis: Compilers; Analysis of Source Program; The Phases of a Compiler; Cousins of the Compiler; The grouping of phases; Compiler- Construction tools.
Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

UNIT – 2 **7 Hours**
Syntax Analysis – 1: The Role of the Parser; Context-free Grammars; Writing a Grammar; Top-down Parsing; Bottom-up Parsing.

UNIT – 3 **7 Hours**
Syntax Analysis – 2
Operator-Precedence Parsing; LR Parsers; Using ambiguous grammars; Parser Generators.

UNIT – 4 **6 Hours**
Syntax-Directed Translation: Syntax-Directed definitions; Constructions of Syntax Trees; Bottom-up evaluation of S-attributed definitions; L-attributed definitions; Top-down translation.

PART – B

UNIT – 5 **6 Hours**
Run-Time Environments: Source Language Issues; Storage Organization; Storage-allocation strategies, Storage-allocation in C; Parameter passing

UNIT – 6 **6 Hours**
Intermediate Code Generation: Intermediate Languages; Declarations; Assignment statements; Boolean Expressions; Case statements; Back patching; Procedure calls.

UNIT – 7 **7 Hours**
Code Generation: Issues in the design of Code Generator; The Target Machine; Run-time Storage Management; Basic blocks and Flow graphs; Next-use information; A Simple Code Generator; Register allocation and assignment; The dag representation of basic blocks; Generating code from dags.

UNIT – 8 **7 Hours**
Code Optimization, Compiler Development: Code Optimization: Introduction; The principal sources of optimization; Peephole optimization; Optimization of basic blocks; Loops in flow graphs.
Compiler Development: Planning a compiler; Approaches to compiler development; the compiler development environment; Testing and maintenance.

Text Books:

1. Alfred V Aho, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, Pearson Education, 2007.
   (Chapters 1, 3.1 to 3.4, 4, 5.1 to 5.5, 7, 8, 9.1 to 9.9, 10.1 to 10.5, 11)

Reference Books:

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Thomson Education, 1997.

DATA COMPRESSION

Subject Code: 10IS663/10CS663	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT –1 **7 Hours**
Introduction, Lossless Compression -1: Compression techniques; Modeling and coding.
Mathematical preliminaries for lossless compression: Overview; Basic concepts of Information Theory; Models; Coding; Algorithmic information theory; Minimum description length principle.
Huffman coding: Overview; The Huffman coding algorithm, Minimumvariance Huffman codes; Application of Huffman coding for text compression.

UNIT – 2 **6 Hours**
Lossless Compression – 2: Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42.
Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

UNIT – 3 **6 Hours**
Basics of Lossy Coding: Some mathematical concepts: Overview; Introduction; Distortion criteria; Models.
Scalar quantization: Overview; Introduction; The quantization problem; Uniform quantizer; Adaptive quantization.

UNIT – 4 **7 Hours**
Vector Quantization, Differential Encoding: Vector quantization: Overview; Introduction; Advantages of vector quantization over scalar quantization; The LBG algorithm.
Differential Encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

PART - B

UNIT – 5 **7 Hours**
Some Mathematical Concepts, Transform coding: Some mathematical concepts: Linear systems; Sampling; Discrete Fourier transform; Z-transform.
Transform coding: Overview; introduction; The transform; Transforms of interest; Quantization and coding for transform coefficients; Application to image compression – JPEG; Application to audio compression – MDCT.

UNIT – 6 **6 Hours**
Subband Coding, Audio Coding: Subband Coding: Overview; introduction; Filters; The basic subband coding algorithm; Bit allocation; Application to speech coding – G.722; Application to audio coding – MPEG audio; Application to image compression.
Audio Coding: Overview; Introduction; MPEG audio coding; MPEG advanced audio coding; Dolby AC3; Other standards.

UNIT – 7 **6 Hours**
Wavelet-Based Compression: Overview; Introduction; Wavelets; Multiresolution and the scaling function; Implementation using Filters; Image compression; Embedded zerotree coder; Set partitioning in hierarchical trees; JPEG 2000.

UNIT – 8 **7 Hours**
Video Compression: Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264, MPEG-4 and advanced video coding; Packet video.

Text Books:
1. Khalid Sayood: Introduction to Data Compression, 3rd Edition, Elsevier, 2006. (Chapters 1, 2 excluding 2.2.1 and 2.4.3, 3.1, 3.2, 3.2.1, 3.8.2, 5, 7.1 to 7.5, 7.6, 7.6.1, 7.6.2, 8.1 to 8.3, 8.6, 9.1 to 9.5, 10.1 to 10.4, 11, 12.6 to 12.9, 13, 14.1 to 14.4, 14.9 to 14.12, 15, 16, 18.1 to 18.13)

Reference Books:
1. D. Salomon: Data Compression: The Complete Reference, Springer, 1998.

PATTERN RECOGNITION

Subject Code: 10IS664/10CS664	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.

UNIT – 2 **7 Hours**
Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminant functions, and decision surfaces; The normal density; Discriminant functions for the normal density.

UNIT – 3 **7 Hours**
Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.

UNIT – 4 **6 Hours**
Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; k_n – Nearest- Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.

PART – B

UNIT – 5 **7 Hours**
Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.

UNIT – 6 **6 Hours**
Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.

UNIT – 7 **6 Hours**
Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.

UNIT – 8 **7 Hours**
Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

Text Books:

1. Richard O. Duda, Peter E. Hart, and David G.Stork: Pattern Classification, 2nd Edition, Wiley-Interscience, 2001.

Reference Books:

1. Earl Gose, Richard Johnsonbaugh, Steve Jost: Pattern Recognition and Image Analysis, Pearson Education, 2007.

COMPUTER GRAPHICS AND VISUALIZATION

Subject Code: 10IS665/10CS65	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The programmer’s interface; Graphics architectures; Programmable Pipelines; Performance Characteristics
Graphics Programming: The Sierpinski gasket; Programming Two Dimensional Applications.

UNIT – 2 **6 Hours**
The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting Implicit Functions

UNIT – 3 **7 Hours**

Input and Interaction: Interaction; Input devices; Clients and Servers; Display Lists; Display Lists and Modeling; Programming Event Driven Input; Menus; Picking; A simple CAD program; Building Interactive Models; Animating Interactive Programs; Design of Interactive Programs; Logic Operations

UNIT – 4 **6 Hours**
Geometric Objects and Transformations-I: Scalars, Points, and Vectors; Three-dimensional Primitives; Coordinate Systems and Frames; Modeling a Colored Cube; Affine Transformations; Rotation, Translation and Scaling;

PART - B

UNIT – 5 **5 Hours**
Geometric Objects and Transformations-II: Geometric Objects and Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices; Interfaces to three-dimensional applications; Quaternion's.

UNIT – 6 **7 Hours**
Viewing: Classical and computer viewing; Viewing with a Computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive Mesh Displays; Parallel-projection matrices; Perspective-projection matrices; Projections and Shadows.

UNIT – 7 **6 Hours**
Lighting and Shading: Light and Matter; Light Sources; The Phong Lighting model; Computation of vectors; Polygonal Shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global Illumination.

UNIT – 8 **8 Hours**
Implementation: Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations.

Text Books:

1. Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson Education, 2008.
   (Chapters 1 to 7)

Reference Books:

1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.
2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 2nd Edition, Pearson education, 2001.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Addison-Wesley 1997.

PROGRAMMING LANGUAGES

Subject Code: 10IS666/10CS666	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**
Introduction; Names, Scope, and Bindings – 1: Language design; Programming language spectrum; why study programming languages? Compilation and interpretation; Programming environments.
Names, scope, and bindings: Concept of binding time; Object lifetime and storage management; Scope rules and implementing scope.

UNIT – 2 **7 Hours**
Names, Scope, and Bindings – 1; Control Flow – 1 : The binding of reference environments; Binding within a scope; Separate compilation.Control Flow – 1: Expression evaluation.

UNIT – 3 **6 Hours**
Control Flow – 2: Structured and unstructured flow; Sequencing; Selection; Iteration; Recursion; Non-determinacy

UNIT – 4 **6 Hours**
Data Types – 1: Type systems; Type checking; Records and variants; Arrays

PART – B

UNIT – 5 **7 Hours**

Data Types – 2: Strings; Sets; Pointers and recursive types; Lists; Files and Input/Output; Equality testing and assignment

UNIT – 6 **6 Hours**

Subroutines and Control Abstraction – 1: Review of stack layout; Calling sequences; Parameter passing; Generic subroutines and modules; Exception handling.

UNIT – 7 **6 Hours**

Control Abstraction – 2; Data Abstraction, Object Orientation: Control abstraction – 2: Coroutines
Data Abstraction, Object Orientation: Object oriented programming; Encapsulation and Inheritance; Dynamic method binding; Multiple inheritance; Object oriented programming revisited

UNIT – 8 **7 Hours**

Functional Languages, Logic Languages, Scripting Languages: Functional Labguages: Origins; Concepts; An overview of scheme; Evaluation order revisited; Higher-order functions; Functional programming in perspective.
Logic Languages: Concepts; Prolog; Logic programming in perspective.
Scripting Languages: Common characteristics

Text Books:

1. Michael L. Scott: Programming Language Pragmatics, 2nd Edition, Elsevier, 2006.
   (Chapters 1.1 to 1.5, 3 excluding the sections on CD, 6 excluding the sections on CD, 7 including the sections on CD, 8 excluding the sections on CD, 9 including the sections on CD, 10 excluding the sections on CD, 11 excluding the sections on CD, 13.1. Note: Text Boxes titled Design & Implementation are excluded)

Reference Books:

1. Ravi Sethi: Programming languages Concepts and Constructs, 2nd Edition, Pearson Education, 1996.
2. R Sebesta: Concepts of Programming Languages, 8th Edition, Pearson Education, 2008.
3. Allen Tucker, Robert Nonan: Programming languages, Tata McGraw-Hill, 2002.

FILE STRUCTURES LABORATORY

Subject Code: 10ISL67	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

PART - A

Design, develop, and implement the following programs

1. Write a C++ program to read series of names, one per line, from standard input and write these names spelled in reverse order to the standard output using I/O redirection and pipes. Repeat the exercise using an input file specified by the user instead of the standard input and using an output file specified by the user instead of the standard output.
2. Write a C++ program to read and write student objects with fixed-length records and the fields delimited by “|”. Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.
3. Write a C++ program to read and write student objects with Variable - Length records using any suitable record structure. Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.
4. Write a C++ program to write student objects with Variable - Length records using any suitable record structure and to read from this file a student record using RRN.
5. Write a C++ program to implement simple index on primary key for a file of student objects. Implement add ( ), search ( ), delete ( ) using the index.
6. Write a C++ program to implement index on secondary key, the name, for a file of student objects. Implement add ( ), search ( ), delete ( ) using the secondary index.
7. Write a C++ program to read two lists of names and then match the names in the two lists using Cosequential Match based on a single loop. Output the names common to both the lists.
8. Write a C++ program to read k Lists of names and merge them using k-way merge algorithm with k = 8.

9. Write a C++ program to implement B-Tree for a given set of integers and its operations insert ( ) and search ( ). Display the tree.
10. Write a C++ program to implement B+ tree for a given set of integers and its operations insert ( ), and search ( ). Display the tree.
11. Write a C++ program to store and retrieve student data from file using hashing. Use any collision resolution technique.
12. Write a C++ program to reclaim the free space resulting from the deletion of records using linked lists.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

SOFTWARE TESTING LABORATORY

Subject Code: 10ISL68	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases and discuss the results.
2. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases and discuss the results.
3. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.
4. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.
5. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.
6. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of equivalence class testing, derive different test cases, execute these test cases and discuss the test results.
7. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of decision table-based testing, derive different test cases, execute these test cases and discuss the test results.
8. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
9. Design, develop, code and run the program in any suitable language to implement the quicksort algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
10. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
11. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.
12. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.

Notes:

- **In the examination *each* student picks one question from the lot of *all* 12 questions.**
- **The programs must be executed in UNIX / LINUX environment.**

VII SEMESTER

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history
Modeling as Design Technique: Modeling; abstraction; The three models.
Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2 **6 Hours**

Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT – 3 **6 Hours**

Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.
Interaction Modeling: Use case models; Sequence models; Activity models.
Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT – 4 **7 Hours**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle.
System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

PART – B

UNIT – 5 **7 Hours**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations.
Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT – 6 **7 Hours**

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.
Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.
Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

UNIT – 7 **6 Hours**

Design Patterns – 1: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description
Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber.

UNIT – 8 **6 Hours**

Design Patterns – 2, Idioms: Management Patterns: Command processor; View handler.
Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.
(Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006.
(Chapters 1, 3.5, 3.6, 4)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley- Dreamtech India, 2004.
4. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

INFORMATION SYSTEMS

Sub Code	**: 10IS72**	**IA Marks**	**:25**
Hrs/Week	**: 04**	**Exam Hours**	**:03**
Total Hrs	**: 52**	**Exam Marks**	**:100**

PART – A

UNIT – 1

Foundation Concepts – 1 **7 Hours**

Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT.
System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems.

UNIT – 2

Foundation Concepts – 2 **6 Hours**

Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating company.

UNIT – 3

Electronic Business Systems **6 Hours**

Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems.
Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems.

UNIT – 4

Enterprise Business Systems **7 Hours**

Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM
Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP.
Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM

PART – B

UNIT – 5

Electronic Commerce Systems **6 Hours**

Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential e-commerce, processes, Electronic payment processes.

e-Commerce applications and issues: E-commerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to-Business e-commerce, e-commerce marketplaces, Clicks and bricks in e-commerce.

UNIT – 6
Decision Support Systems **7 Hours**
Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

UNIT – 7
Security and Ethical Challenges **7 Hours**
Security, Ethical and societal challenges of IT: Introduction, Ethical responsibility of business professionals, Computer crime, Privacy issues, Other challenges, Health issues, Societal solutions.
Security management of IT: Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits.

UNIT – 8
Enterprise and Global Management of IT **6 Hours**
Managing IT: Business and IT, Managing IT, Business / IT planning, Managing the IS function, Failures of IT management.
Managing global IT: The International Dimension, Global IT Management, Cultural, Political and Geo - Economic challenges, Global Business/ IT strategies, Global Business / IT applications, Global IT Platforms, Global data access issues, Global Systems development.

Text Books:

1. James A. O' Brien, George M. Marakas: Management Information Systems, 7th Edition, Tata McGraw Hill, 2006.
   (Chapters 1, 2, 7, 8, 9, 10, 13, 14)

Reference Books:

1. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Managing the Digital Firm, 9th Edition, Pearson Education, 2006.
2. Steven Alter: Information Systems The Foundation of E-Business, 4th Edition, Pearson Education, 2002.
3. W.S. Jawadekar: Management Information Systems, Tata McGraw Hill 1998.

PROGRAMMING THE WEB

Subject Code: 10CS73	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

UNIT – 1 **6 Hours**
Fundamentals of Web, XHTML – 1: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, The Web Programmers Toolbox.
XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links.

UNIT – 2 **7 Hours**
XHTML – 2, CSS: XHTML (continued): Lists, Tables, Forms, Frames
CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span> and <div> tags, Conflict resolution.

UNIT – 3 **6 Hours**
Javascript: Overview of Javascript, Object orientation and Javascript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

UNIT – 4 **7 Hours**
Javascript and HTML Documents, Dynamic Documents with Javascript: The Javascript execution environment, The Document Object Model, Element access in Javascript, Events and event handling, Handling

events from the Body elements, Button elements, Text box and Password elements, The DOM 2 event model, The navigator object, DOM tree traversal and modification.
Introduction to dynamic documents, Positioning elements, Moving elements, Element visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Slow movement of elements, Dragging and dropping elements.

PART - B

UNIT – 5 **6 Hours**
XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

UNIT – 6 **7 Hours**
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.
The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies. Database access with Perl and MySQL

UNIT – 7 **6 Hours**
PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

UNIT – 8 **7 Hours**
Ruby, Rails: Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

Text Books:
1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson education, 2008. (Listed topics only from Chapters 1 to 9, 11 to 15)

Reference Books:
1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to Program, 3rd Edition, Pearson education, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
3. Xue Bai et al: The web Warrior Guide to Web Programming, Thomson, 2003.

DATA WAREHOUSING AND DATA MINING

Subject Code: 10IS74/10CS755	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**
Data Warehousing:
Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses. Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata

UNIT – 2 **6 Hours**
Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.

UNIT – 3 **6 Hours**
Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications

UNIT – 4 **8 Hours**

Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns

PART - B

UNIT – 5 **6 Hours**

Classification -1 : Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers.

UNIT – 6 **6 Hours**

Classification - 2: Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

UNIT – 7 **8 Hours**

Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

UNIT – 8 **6 Hours**

Web Mining: Introduction, Web content mining, Text Mining, Unstructured Text, Text clustering, Mining Spatial and Temporal Databases.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, Mc GrawHill Publisher, 1997.

ADVANCED DBMS

Subject Code: 10IS751/10CS751	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**

Overview of Storage and Indexing, Disks and Files: Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning

Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats

UNIT – 2 **7 Hours**

Tree Structured Indexing: Intuition for tree indexes; Indexed sequential access method; B+ trees, Search, Insert, Delete, Duplicates, B+ trees in practice

UNIT – 3 **6 Hours**

Hash-Based Indexing: Static hashing; Extendible hashing, Linear hashing, comparisons

UNIT – 4 **6 Hours**

Overview of Query Evaluation, External Sorting : The system catalog; Introduction to operator evaluation; Algorithms for relational operations; Introduction to query optimization; Alternative plans: A motivating example; what a typical optimizer does.

When does a DBMS sort data? A simple two-way merge sort; External merge sort

PART - B

UNIT – 5 **6 Hours**

Evaluating Relational Operators : The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering

UNIT – 6 **7 Hours**

A Typical Relational Query Optimizer: Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries; other approaches to query optimization.

UNIT – 7 **7 Hours**

Physical Database Design and Tuning: Introduction; Guidelines for index selection, examples; Clustering and indexing; Indexes that enable index-only plans; Tools to assist in index selection; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views; Impact of concurrency; DBMS benchmarking.

UNIT – 8 **6 Hours**

More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management

Text Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
   (Chapters 8, 9, 10, 11, 12, 13.1 to 13.3, 14, 15, 20)
2. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison-Wesley, 2007.
   (Chapter 30)

Reference Books:

1. Connolly and Begg: Database Systems, 3th Edition, Pearson Publications, 2002.

EMBEDDED COMPUTING SYSTEMS

Subject Code: 10IS752/10CS72	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART- A

UNIT – 1 **6 Hours**

Embedded Computing: Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process, Formalism for System design
Design Example: Model Train Controller.

UNIT – 2 **7 Hours**

Instruction Sets, CPUs: Preliminaries, ARM Processor, Programming Input and Output, Supervisor mode, Exceptions, Traps, Coprocessors, Memory Systems Mechanisms, CPU Performance, CPU Power Consumption. Design Example: Data Compressor.

UNIT – 3 **6 Hours**

Bus-Based Computer Systems: CPU Bus, Memory Devices, I/O devices, Component Interfacing, Designing with Microprocessor, Development and Debugging, System-Level Performance Analysis
Design Example: Alarm Clock.

UNIT – 4 **7 Hours**

Program Design and Analysis: Components for embedded programs, Models of programs, Assembly, Linking and Loading, Basic Compilation Techniques, Program optimization, Program-Level performance analysis, Software performance optimization, Program-Level energy and power analysis, Analysis and optimization of program size, Program validation and testing. Design Example: Software modem.

PART- B

UNIT – 5 **6 Hours**

Real Time Operating System (RTOS) Based Design – 1: Basics of OS, Kernel, types of OSs, tasks, processes, Threads, Multitasking and Multiprocessing, Context switching, Scheduling Policies, Task Communication, Task Synchronization.

UNIT – 6 **6 Hours**

RTOS-Based Design - 2: Inter process Communication mechanisms, Evaluating OS performance, Choice of RTOS, Power Optimization. Design Example: Telephone Answering machine

UNIT – 7 **7 Hours**

Distributed Embedded Systems: Distributed Network Architectures, Networks for Embedded Systems: I2C Bus, CAN Bus, SHARC Link Ports, Ethernet, Myrinet, Internet, Network Based Design. Design Example: Elevator Controller.

UNIT – 8 **7 Hours**

Embedded Systems Development Environment: The Integrated Development Environment, Types of File generated on Cross Compilation, Dis-assembler /Decompiler, Simulators, Emulators, and Debugging, Target Hardware Debugging.

Text Books:

1. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008.
2. Shibu K V: Introduction to Embedded Systems, Tata McGraw Hill, 2009
   (Chapters 10, 13)

Reference Books:

1. James K. Peckol: Embedded Systems, A contemporary Design Tool, Wiley Student Edition, 2008.
2. Tammy Neorgaard: Embedded Systems Architecture, Elsevier, 2005.

JAVA AND J2EE

Subject Code: 10IS753/10CS753	**IA Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART - A

UNIT – 1 **6 Hours**

Introduction to Java: Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs.

Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings

Control Statements: Selection statements, iteration statements, Jump Statements.

UNIT – 2 **6 Hours**

Classes, Inheritance, Exceptions, Applets: Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling**:** Exception handling in Java.

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console.

UNIT – 3 **7 Hours**

Multi Threaded Programming, Event Handling: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems.

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

UNIT – 4 **7 Hours**

Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

PART – B

UNIT – 5 **6 Hours**

Java 2 Enterprise Edition Overview, Database Access: Overview of J2EE and J2SE
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

UNIT – 6 **7 Hours**

Servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.

UNIT – 7 **6 Hours**

JSP, RMI: Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.
Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

UNIT – 8 **7 Hours**

Enterprise Java Beans: Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:

1. Herbert Schildt: Java - The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.
   (Chapters 1, 2, 3, 4, 5, 6, 8, 10, 11, 21, 22, 29, 30, 31)
2. Jim Keogh: J2EE - The Complete Reference, Tata McGraw Hill, 2007.
   (Chapters 5, 6, 11, 12, 15)

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education, 2004.

MULTIMEDIA COMPUTING

Subject Code: 10IS754/10CS754	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Media and Data Streams, Audio Technology: Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases.
Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Characterizing Data Streams: Asynchronous Transmission Mode, Synchronous Transmission Mode, Isochronous Transmission Mode; Characterizing Continuous Media Data Streams.
Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers; Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

UNIT – 2 **7 Hours**

Graphics and Images, Video Technology, Computer-Based Animation: Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options.
Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation; Transmission of Animation; Virtual Reality Modeling Language.

UNIT – 3 **7 Hours**

Data Compression – 1: Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode

UNIT – 4 **6 Hours**

Data Compression – 2: H.261 (Px64) and H.263: Image Preparation, Coding Algorithms, Data Stream, H.263+ and H.263L; MPEG: Video Encoding, Audio Coding, Data Stream, MPEG-2, MPEG-4, MPEG-7; Fractal Compression.

PART - B

UNIT – 5 **6 Hours**
Optical Storage Media: History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable; Compact Disc Magneto-Optical; Compact Disc Read/Write; Digital Versatile Disc.

UNIT – 6 **6 Hours**
Content Analysis : Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; Applications.

UNIT – 7 **6 Hours**
Data and File Format Standards: Rich-Text Format; TIFF File Format; Resource Interchange File Format (RIFF); MIDI File Format; JPEG DIB File Format for Still and Motion Images; AVI Indeo File Format; MPEG Standards; TWAIN

UNIT – 8 **7 Hours**
Multimedia Application Design : Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases; Application Workflow Design Issues; Distributed Application Design Issues.

Text Books:

1. Ralf Steinmetz, Klara Narstedt: Multimedia Fundamentals: Vol 1-Media Coding and Content Processing, 2nd Edition, Pearson Education, 2003.
   (Chapters 2, 3, 4, 5, 6, 7, 8, 9)
2. Prabhat K. Andleigh, Kiran Thakrar: Multimedia Systems Design, PHI, 2003.
   (Chapters 1, 3, 7)

Reference Books:

1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson Education, 2002.
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.

ADVANCED SOFTWARE ENGINEERING

Subject Code: 10IS755	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **7 Hours**
Quality Management: Quality Concepts: Quality, Software quality; The software quality dilemma; Achieving software quality.
Review techniques: Cost impact of Software defects; Defect amplification and removal; Review metrics and their use; Reviews: A formal spectrum; Informal reviews; Formal technical reviews.
Software Quality Assurance: Background issues, Elements of SQA; SQA tasks, goals and metrics; Formal approaches to SQA; Statistical software quality assurance; Software reliability; The ISO 9000 Quality standards; The SQA plan.

UNIT – 2 **6 Hours**
Formal Modeling and Verification: The Cleanroom Strategy; Functional specification; Cleanroom design; Cleanroom testing; Formal methods concepts; Applying mathematical notation for formal specification; Formal specification languages.

UNIT – 3 **7 Hours**
Process Improvement, Configuration Management: Process and product quality; Process classification; Process measurement; Process analysis and modeling; Process change; The CMMI process improvement framework
Configuration management planning; Change management; Version and release management; System building; CASE tools for configuration management

UNIT – 4 **6 Hours**

Software Process and Project Metrics: Metrics in the Process and Project Domains; Software Measurement; Metrics for software quality; Integrating metrics within the software process; Metrics for small organizations; Establishing a software metrics program.

PART - B

UNIT – 5 **7 Hours**

Software Reuse, CBSE: The reuse landscape; Design patterns; Generator-based reuse; Application frameworks; Application system reuse.

Components and component models; The CBSE process; Component composition

UNIT – 6 **6 Hours**

Critical Systems Development and Validation: Dependable processes; Dependable programming; Fault tolerance; Fault-tolerant architectures

Reliability validation; Safety assurance; Security assessment; Safety and dependability cases

UNIT – 7 **7 Hours**

User Interface Design, Maintenance and Reengineering: User interface design issues; The UI design process; User analysis; User interface prototyping; Interface evaluation.

Software maintenance; Reengineering; Business process reengineering; Software reengineering; Reverse engineering; Restructuring; Forward engineering; The economics of reengineering.

UNIT – 8 **6 Hours**

Service-Oriented Software Engineering, Aspect-Oriented Software Development: Services as reusable components; Service engineering; Software development with services

Aspect-Oriented Software Development: The separation of concerns; Aspects, join points and pointcuts; Software engineering with aspects.

Text Books:

1. Roger S. Pressman: Software Engineering: A Practitioner's Approach, 7th Edition, McGraw Hill, 2007. (Chapters 14, 15, 16, 21, 25, 29)
2. Sommerville: Software Engineering, 8th Edition, Addison-Wesley, 2007. (Chapters 16, 18, 19, 20, 24, 28, 29, 31, 32)

Reference Books:

1. Pfleeger: Software Engineering Theory and Practice, 2nd Edition, Pearson Education, 2001.
2. Waman S Jawadekar: Software Engineering Principles and Practice, Tata McGraw Hill, 2004.

NEURAL NETWORKS

Subject Code: 10IS756/10CS756	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1

Introduction **7 Hours**

What is a Neural Network?, Human Brain, Models of Neuron, Neural Networks viewed as directed graphs, Feedback, Network Architectures, Knowledge representation, Artificial Intelligence and Neural Networks.

UNIT – 2

Learning Processes – 1 **6 Hours**

Introduction, Error-correction learning, Memory-based learning, Hebbian learning, Competitive learning,Boltzamann learning, Credit Assignment problem, Learning with a Teacher, Learning without a Teacher, Learning tasks, Memory, Adaptation.

UNIT – 3 **7 Hours**

Learning Processes – 2, **Single Layer Perceptrons:** Statistical nature of the learning process, Statistical learning theory, Approximately correct model of learning.

Single Layer Perceptrons: Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Linear least-squares filters**,** Least-mean square algorithm, Learning curves, Learning rate annealing techniques, Perceptron, Perceptron convergence theorem, Relation between the Perceptron and Bayes classifier for a Gaussian environment.

UNIT – 4 **6 Hours**

Multilayer Perceptrons – 1: Introduction, Some preliminaries, Back-propagation Algorithm, Summary of back-propagation algorithm, XOR problem, Heuristics for making the back-propagation algorithm perform better, Output representation and decision rule, Computer experiment, Feature detection, Back-propagation and differentiation.

PART - B

UNIT – 5 **7 Hours**

Multilayer Perceptrons – 2: Hessian matrix, Generalization, approximation of functions, Cross validation, Network pruning techniques, virtues and limitations of back- propagation learning, Accelerated convergence of back propagation learning, Supervised learning viewed as an optimization problem, Convolution networks.

UNIT – 6 **6 Hours**

Radial-Basic Function Networks – 1: Introduction, Cover's theorem on the separability of patterns, Interpolation problem, Supervised learning as an ill-posed Hypersurface reconstruction problem, Regularization theory, Regularization networks, Generalized radial-basis function networks, XOR problem, Estimation of the regularization parameter.

UNIT – 7 **6 Hours**

Radial-Basic Function Networks – 2, Optimization – 1: Approximation properties of RBF networks, Comparison of RBF networks and multilayer Perceptrons, Kernel regression and it's relation to RBF networks, Learning strategies, Computer experiment.

Optimization using Hopfield networks: Traveling salesperson problem, Solving simultaneous linear equations, Allocating documents to multiprocessors.

UNIT – 8 **7 Hours**

Optimization Methods – 2:

Iterated gradient descent, Simulated Annealing, Random Search, Evolutionary computation- Evolutionary algorithms, Initialization, Termination criterion, Reproduction, Operators, Replacement, Schema theorem.

Text Books:

1. Simon Haykin: Neural Networks - A Comprehensive Foundation, 2nd Edition, Pearson Education, 1999. (Chapters 1.1-1.8, 2.1-2.15, 3.1-3.10, 4.1-4.19, 5.1-5.14)
2. Kishan Mehrotra, Chilkuri K. Mohan, Sanjay Ranka: Artificial Neural Networks, Penram International Publishing, 1997.
   (Chapters 7.1-7.5)

Reference Books:

1. B.Yegnanarayana: Artificial Neural Networks, PHI, 2001.

C# PROGRAMMING AND .NET

Subject Code: 10IS761/10CS761	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 2 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator-

Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 3 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly ,Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

UNIT – 4 **6 Hours**

Object- Oriented Programming with C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo-Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The " Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between .

PART – B

UNIT – 5 **6 Hours**

Exceptions and Object Lifetime: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handing, the System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception(System. System Exception), Custom Application-Level Exception(System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type.

UNIT – 6 **6 Hours**

Interfaces and Collections: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies, Implementing, Implementation, Interfaces Using VS .NET, understanding the IConvertible Interface, Building a Custom Enumerator (IEnumerable and Enumerator), Building Cloneable objects (ICloneable), Building Comparable Objects (I Comparable), Exploring the system. Collections Namespace, Building a Custom Container (Retrofitting the Cars Type).

UNIT – 7 **8 Hours**

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, The Simplest Possible Delegate Example, , Building More a Elaborate Delegate Example, Understanding Asynchronous Delegates, Understanding (and Using)Events.

The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, A Variation of the Cars Indexer Internal Representation of Type Indexer . Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator-Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines, The Internal Representations of Customs Conversion Routines

UNIT – 8 **6 Hours**

Understanding .NET Assembles: Problems with Classic COM Binaries, An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly, Using a Shared Assembly

Text Books:

1. Andrew Troelsen: Pro C# with .NET 3.0, Special Edition, Dream tech Press, India, 2007.
   Chapters: 1 to 11 (up to pp.369)
2. E. Balagurusamy: Programming in C#, 5^{th} Reprint, Tata McGraw Hill, 2004.
   (Programming Examples 3.7, 3.10, 5.5, 6.1, 7.2, 7.4, 7.5, 7.6, 8.1, 8.2, 8.3, 8.5, 8.7, 8.8, 9.1, 9.2, 9.3, 9.4, 10.2, 10.4, 11.2, 11.4, 12.1, 12.4, 12.5, 12.6, 13.1, 13.2, 13.3, 13.6, 14.1, 14.2, 14.4, 15.2, 15.3, 16.1, 16.2, 16.3, 18.3, 18.5.18.6)

Reference Books:

1. Tom Archer: Inside C#, WP Publishers, 2001.
2. Herbert Schildt: C# The Complete Reference, Tata McGraw Hill, 2004.

DIGITAL IMAGE PROCESSING

Subject Code: 10IS762/10CS762	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Digitized Image and its properties:
Basic concepts, Image digitization, Digital image properties

UNIT – 2 **7 Hours**

Image Preprocessing: Image pre-processing: Brightness and geometric transformations, local preprocessing.

UNIT – 3 **7 Hours**

Segmentation – 1: Thresholding, Edge-based segmentation.

UNIT – 4 **7 Hours**

Segmentation – 2: Region based segmentation, Matching.

PART – B

UNIT – 5 **7 Hours**

Image Enhancement: Image enhancement in the spatial domain: Background, Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/ logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Image enhancement in the frequency domain: Background, Introduction to the Fourier transform and the frequency domain, Smoothing Frequency-Domain filters, Sharpening Frequency Domain filters, Homomorphic filtering.

UNIT – 6 **6 Hours**

Image Compression: Image compression: Fundamentals, Image compression models, Elements of information theory, Error-Free Compression, Lossy compression.

UNIT – 7 **7 Hours**

Shape representation: Region identification, Contour-based shape representation and description, Region based shape representation and description, Shape classes.

UNIT – 8 **6 Hours**

Morphology: Basic morphological concepts, Morphology principles, Binary dilation and erosion, Gray-scale dilation and erosion, Morphological segmentation and watersheds

Text Books:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle: Image Processing, Analysis and Machine Vision, 2nd Edition, Thomoson Learning, 2001.
   (Chapters 2, 4.1 to 4.3, 5.1 to 5.4, 6, 11.1 to 11.4, 11.7)
2. Rafel C Gonzalez and Richard E Woods: Digital Image Processing, 2^{nd} Edition, Pearson Education, 2003.
   (Chapters 3.1 to 3.7, 4.1 to 4.5, 8.1 to 8.5)

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", Pearson Education/Prentice-Hall of India Pvt. Ltd., 1997.
2. B.Chanda ,D Dutta Majumder, "Digital Image Processing and Analysis", Prentice-Hall, India, 2002.

GAME THEORY

Subject Code: 10IS763/10CS763	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1 **8 Hours**

Introduction, Strategic Games: What is game theory? The theory of rational choice; Interacting decision makers. Strategic games; Examples: The prisoner's dilemma, Bach or Stravinsky, Matching pennies; Nash equilibrium; Examples of Nash equilibrium; Best-response functions; Dominated actions; Equilibrium in a single population: symmetric games and symmetric equilibria.

UNIT – 2 **6 Hours**

Mixed Strategy Equilibrium: Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Dominated actions; Pure equilibria when randomization is allowed, Illustration: Expert Diagnosis; Equilibrium in a single population, Illustration: Reporting a crime; The formation of players' beliefs; Extensions; Representing preferences by expected payoffs.

UNIT – 3 **6 Hours**

Extensive Games: Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games: Backward induction. Illustrations: The ultimatum game, Stackelberg's model of duopoly, Buying votes.

UNIT – 4 **6 Hours**

Extensive games: Extensions and Discussions: Extensions: Allowing for simultaneous moves, Illustrations: Entry in to a monopolized industry, Electoral competition with strategic voters, Committee decision making, Exit from a declining industry; Allowing for exogenous uncertainty, Discussion: subgame perfect equilibrium and backward induction.

PART – B

UNIT – 5 **7 Hours**

Bayesian Games, Extensive Games with Imperfect Information: Motivational examples; General definitions; Two examples concerning information; Illustrations: Cournot's duopoly game with imperfect information, Providing a public good, Auctions; Auctions with an arbitrary distribution of valuations.
Extensive games with imperfect information; Strategies; Nash equilibrium; Beliefs and sequential equilibrium; Signaling games; Illustration: Strategic information transmission.

UNIT – 6 **7 Hours**

Strictly Competitive Games, Evolutionary Equilibrium: Strictly competitive games and maximization; Maximization and Nash equilibrium; Strictly competitive games; Maximization and Nash equilibrium in strictly competitive games.
Evolutionary Equilibrium: Monomorphic pure strategy equilibrium; Mixed strategies and polymorphic equilibrium; Asymmetric contests; Variations on themes: Sibling behavior, Nesting behavior of wasps, The evolution of sex ratio.

UNIT – 7 **6 Hours**

Iterated Games: Repeated games: The main idea; Preferences; Repeated games; Finitely and infinitely repeated Prisoner's dilemma; Strategies in an infinitely repeated Prisoner's dilemma; Some Nash equilibria of an infinitely repeated Prisoner's dilemma, Nash equilibrium payoffs of an infinitely repeated Prisoner's dilemma.

UNIT – 8 **6 Hours**

Coalitional Games and Bargaining: Coalitional games. The Core. Illustrations: Ownership and distribution of wealth, Exchanging homogeneous items, Exchanging heterogeneous items, Voting, Matching. Bargaining as an extensive game; Illustration of trade in a market; Nash's axiomatic model of bargaining

Text Books:

1. Martin Osborne: An Introduction to Game Theory, Oxford University Press, Indian Edition, 2004. (Listed topics only from Chapters 1 to 11, 13, 14, 16)

Reference Books:

1. Roger B. Myerson: Game Theory: Analysis of Conflict, Harvard University Press, 1997.
2. Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green: Microeconomic Theory. Oxford University Press, New York, 1995.
3. Philip D. Straffin, Jr.: Game Theory and Strategy, The Mathematical Association of America, January 1993.

ARTIFICIAL INTELLIGENCE

Subject Code: 10IS764/10CS764	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**

Total Hours : 52 **Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies.

UNIT – 2 **7 Hours**

Informed Search, Exploration, Constraint Satisfaction, Adversial Search: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs. Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning.

UNIT – 3 **6 Hours**

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic; propositional logic Reasoning patterns in propositional logic; Effective propositional inference; Agents based on propositional logic.

UNIT – 4 **6 Hours**

First-Order Logic, Inference in First-Order Logic – 1: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. Propositional versus first-order inference; Unification and lifting

PART – B

UNIT – 5 **6 Hours**

Inference in First-Order Logic – 2: Forward chaining; Backward chaining; Resolution.

UNIT – 6 **7 Hours**

Knowledge Representation: Ontological engineering; Categories and objects; Actions, situations, and events; Mental events and mental objects; The Internet shopping world; Reasoning systems for categories; Reasoning with default information; Truth maintenance systems.

UNIT – 7 **7 Hours**

Planning, Uncertainty, Probabilistic Reasoning: Planning: The problem; Planning with state-space approach; Planning graphs; Planning with propositional logic.
Uncertainty: Acting under certainty; Inference using full joint distributions; Independence; Bayes' rule and its use.
Probabilistic Reasoning: Representing knowledge in an uncertain domain; The semantics of Bayesian networks; Efficient representation of conditional distributions; Exact inference in Bayesian networks.

UNIT – 8 **6 Hours**

Learning, AI: Present and Future: Learning: Forms of Learning; Inductive learning; Learning decision trees; Ensemble learning; Computational learning theory.
AI: Present and Future: Agent components; Agent architectures; Are we going in the right direction? What if AI does succeed?

Text Books:

1. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition, Pearson Education, 2003.
   (Chapters 1.1, 2, 3.1 to 3.4, 4.1, 4.2, 4.5, 5.1, 5.2, 6.1, 6.2, 6.3, 7, 8, 9, 10, 11.1, 11.2, 11.4, 11.5, 13.1, 13.4, 13.5, 13.6, 14.1, 14.2, 14.3, 14.4, 18, 27)

Reference Books:

1. Elaine Rich, Kevin Knight: Artificial Intelligence, 2nd Edition, Tata McGraw Hill, 1991.
2. Nils J. Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.

STORAGE AREA NETWORKS

Subject Code: 10IS765/10CS765	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART –A

UNIT - 1 **7 Hours**

Introduction to Information Storage and Management, Storage System Environment: Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle
Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

UNIT - 2 **6 Hours**
Data Protection, Intelligent Storage system: Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares
Components of an Intelligent Storage System, Intelligent Storage Array

UNIT - 3 **7 Hours**
Direct-Attached Storage, SCSI, and Storage Area Networks: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fibre Channel, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies.

UNIT - 4 **6 Hours**
NAS, IP SAN: General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability. iSCSI, FCIP.

PART - B

UNIT - 5 **6 Hours**

Content-Addressed Storage, Storage Virtualization: Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples
Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization

UNIT - 6 **6 Hours**
Business Continuity, Backup and Recovery: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions.
Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

UNIT - 7 **7 Hours**
Local Replication, Remote Replication: Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface, Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure.

UNIT - 8 **7 Hours**
Securing the Storage Infrastructure, Managing the Storage Infrastructure: Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking
Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution.

Text Books:

1. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management, EMC Education Services, Wiley- India, 2009.

Reference Books:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
2. Rebert Spalding: Storage Networks, The Complete Reference, Tata McGraw Hill, 2003.
3. Richard Barker and Paul Massiglia: Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs, Wiley India, 2002.

FUZZY LOGIC

Subject Code: 10IS766/10CS766	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **7 Hours**

Introduction, Classical Sets and Fuzzy Sets: Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity.

Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions

Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes

UNIT – 2 **6 Hours**

Classical Relations and Fuzzy Relations: Cartesian Product, Crisp Relations - Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Non-interactive Fuzzy Sets. Tolerance and Equivalence Relations - Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations. Value Assignments - Cosine Amplitude, Max-min Method, Other Similarity methods

UNIT – 3 **6 Hours**

Membership Functions: Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Inductive Reasoning.

UNIT – 4 **7 Hours**

Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic: Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods

Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets – Extension Principle, Fuzzy Transform (Mapping), Practical Considerations, Fuzzy Numbers

Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons, Fuzzy Vectors

PART - B

UNIT – 5 **6 Hours**

Classical Logic and Fuzzy Logic: Classical Predicate Logic – Tautologies, Contradictions, Equivalence, Exclusive OR and Exclusive NOR, Logical Proofs, Deductive Inferences. Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence and Logical Proofs, Other forms of the Implication Operation, Other forms of the Composition Operation

UNIT – 6 **6 Hours**

Fuzzy Rule- Based Systems: Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

UNIT – 7 **7 Hours**

Fuzzy Decision Making : Fuzzy Synthetic Evaluation, Fuzzy Ordering, Preference and consensus, Multiobjective Decision Making, Fuzzy Bayesian Decision Method, Decision Making under Fuzzy States and Fuzzy Actions.

UNIT – 8 **7 Hours**

Fuzzy Classification: Classification by Equivalence Relations - Crisp Relations, Fuzzy Relations. Cluster Analysis, Cluster Validity, c-Means Clustering - Hard c-Means (HCM), Fuzzy c-Means (FCM). Classification Metric, Hardening the Fuzzy c-Partition, Similarity Relations from Clustering

Text Books:

1. Timothy J. Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill, 1997.
   (Chapter 1 (pp 1-14), Chapter 2 (pp 17-34), Chapter 3 (pp 46-70), Chapter 4 (pp 87-122), Chapter 5 (pp 130-146), Chapter 6 (pp 151-178), Chapter 7 (pp 183-210), Chapter 8 (pp 232-254), Chapter 9 (pp 313-352), Chapter 10 (pp 371 – 400))

Reference Books:

1. B Kosko: Neural Networks and Fuzzy systems: A Dynamical System approach, Prentice Hall 1991.

Networks Laboratory

Subject Code: 10CSL77	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

Note: Student is required to solve one problem from PART-A and one problem from PART-B. The questions are allotted based on lots. Both questions carry equal marks.

PART A – Simulation Exercises

The following experiments shall be conducted using either NS228/OPNET or any other suitable simulator.

1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the links connected as follows:
   n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
5. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
6. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

PART-B

Implement the following in C/C++:

7. Write a program for error detecting code using CRC-CCITT (16- bits).
8. Write a program for distance vector algorithm to find suitable path for transmission.
9. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
10. Implement the above program using as message queues or FIFOs as IPC channels.
11. Write a program for simple RSA algorithm to encrypt and decrypt the data.
12. Write a program for congestion control using leaky bucket algorithm.

Note:
In the examination, a combination of one problem has to be asked from Part A for a total of 25 marks and one problem from Part B has to be asked for a total of 25 marks. The choice must be based on random selection from the entire lots.

Web Programming Laboratory

Subject Code: 10CSL78	**I.A. Marks : 25**
Hours/Week : 03	**Exam Hours: 03**
Total Hours : 42	**Exam Marks: 50**

1. Develop and demonstrate a XHTML file that includes Javascript script for the following problems:
   a) Input: A number n obtained using prompt
      Output: The first n Fibonacci numbers
   b) Input: A number n obtained using prompt
      Output: A table of numbers from 1 to n and their squares using **alert**
2. a) Develop and demonstrate, using Javascript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
   b) Modify the above program to get the current semester also (restricted to be a number from 1 to 8)
3. a) Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
4. a) Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.

5. a) Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.

   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.
6. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a Perl program to display a digital clock which displays the current time of the server.
8. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
9. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
10. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
11. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on Name.
12. Build a Rails application to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

VIII SEMESTER

SOFTWARE ARCHITECTURES

Subject Code: 10IS81	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Introduction: The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle; What makes a "good" architecture? What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

UNIT – 2 **7 Hours**

Architectural Styles and Case Studies: Architectural styles; Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures. Case Studies: Keyword in Context; Instrumentation software; Mobile robotics; Cruise control; Three vignettes in mixed style.

UNIT – 3 **6 Hours**

Quality: Functionality and architecture; Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving

Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles.

UNIT – 4 **7 Hours**
Architectural Patterns – 1: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard.

PART – B

UNIT – 5 **7 Hours**
Architectural Patterns – 2: Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction-Control.

UNIT – 6 **6 Hours**
Architectural Patterns – 3: Adaptable Systems: Microkernel; Reflection.

UNIT – 7 **6 Hours**
Some Design Patterns: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy.

UNIT – 8 **7 Hours**
Designing and Documenting Software Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, 2003.
   (Chapters 1, 2, 4, 5, 7, 9)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006.
   (Chapters 2, 3.1 to 3.4)
3. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, Prentice-Hall of India, 2007.
   (Chapters 1.1, 2, 3)

Reference Books:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.
2. **Web site for Patterns:** http://www.hillside.net/patterns/

SYSTEM MODELING AND SIMULATION

Sub Code	**: 10CS82**	**IA Marks**	**: 25**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT – 1 **8 Hours**
Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet.

UNIT – 2 **6 Hours**
General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java; Simulation in GPSS

UNIT – 3 **6 Hours**
Statistical Models in Simulation: Review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

UNIT – 4 **6 Hours**

Queuing Models: Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1 queue; Networks of queues; Rough-cut modeling: An illustration..

PART – B

UNIT – 5 **8 Hours**

Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.

UNIT – 6 **6 Hours**

Input Modeling : Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models.

UNIT – 7 **6 Hours**

Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

UNIT – 8 **6 Hours**

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson, 2010.
   (Listed topics only from Chapters1 to 12)

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007.

WIRELESS NETWORKS AND MOBILE COMPUTING

Sub Code	**: 10IS831/10CS831**	**IA Marks**	**: 25**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT – 1 **6 Hours**

Mobile Computing Architecture: Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing

UNIT – 2 **7 Hours**

Wireless Networks – 1: GSM and SMS: Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

UNIT – 3 **6 Hours**

Wireless Networks – 2: GPRS : GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

UNIT – 4 **7 Hours**

Wireless Networks – 3: CDMA, 3G and WiMAX: Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

PART - B

UNIT – 5 **6 Hours**

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices.Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

UNIT – 6 **7 Hours**

Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux, Proprietary OS Client Development : The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT – 7 **6 Hours**

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

UNIT – 8 **7 Hours**

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

WEB 2.0 AND RICH INTERNET APPLICATIONS

Sub Code	**: 10IS832/10CS832**	**IA Marks**	**: 25**
Hrs/ Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT – 1 **6 Hours**

Introduction, Ajax – 1: Web 2.0 and Rich Internet Applications, Overview of Ajax, Examples of usage of Ajax: Updating web page text, Chatting in real time, Dragging and dropping, Downloading images. Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST, Using Ajax together with XML.

UNIT – 2 **7 Hours**

Ajax – 2: Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects, Using inner functions, Downloading JavaScript, connecting to Google Suggest, Creating google.php, Downloading from other domains with Ajax, HTML header request and Ajax, Defeating caching, Examples.Building XML and working with XML in JavaScript, Getting the document element, Accessing any XML element, Handling whitespace in Firefox, Handling cross-browser whitespace, Accessing XML data directly, Validating XML, Further examples of Rich Internet Applications with Ajax.

UNIT – 3 **6 Hours**

Ajax – 3: Drawing user's attention to downloaded text, Styling text, colors and background using CSS, Setting element location in the web pages, Setting the stacking order of web page elements, Further examples of using Ajax. Displaying all the data in an HTML form, Working with PHP server variables, Getting the data in to array format, Wrapping applications in to a single PHP page, Validating input from the user, Validating integers and text, DOM, Appending new elements to a web page using the DOM and Ajax, Replacing elements using the DOM, Handling timeouts in Ajax, Downloading images with Ajax, Example programs.

UNIT – 4 **7 Hours**

Flex – 1 : Introduction: Understanding Flex Application Technologies, Using Flex Elements, Working with Data Services (Loading Data at Runtime), The Differences between Traditional and Flex Web Applications, Understanding How Flex Applications Work, Understanding Flex and Flash Authoring. Building Applications with the Flex Framework: Using Flex Tool Sets, Creating Projects, Building Applications, Deploying Applications Framework Fundamentals: Understanding How Flex Applications Are Structured, Loading and Initializing Flex Applications, Understanding the Component Life Cycles, Loading One Flex Application into Another Flex Application, Differentiating Between Flash Player and the Flex Framework, Caching the Framework, Understanding Application Domains, Localization, Managing Layout: Flex Layout Overview, Making Fluid Interfaces, Putting It All Together.

PART B

UNIT – 5 **7 Hours**

Flex – 2: MXML: Understanding MXML Syntax and Structure, Making MXML Interactive Working with UI Components: Understanding UI Components, Buttons, Value Selectors, Text Components, List-Based Controls, Pop-Up Controls, Navigators, Control Bars Customizing Application Appearance: Using Styles, Skinning components, Customizing the preloader, Themes, Runtime CSS

UNIT – 6 **6 Hours**

Flex – 3: ActionScript: Using ActionScript, MXML and ActionScript Correlations, Understanding ActionScript Syntax, Variables and Properties, Inheritance, Interfaces, Handling Events, Error Handling, Using XML

UNIT – 7 **7 Hours**

Flex – 4: Managing State: Creating States, Applying States, Defining States, Adding and Removing Components, Setting Properties, Setting Styles, Setting Event Handlers, Using Action Scripts to Define States, Managing Object Creation Policies, Handling State Events, Understanding State Life Cycles, When To Use States.Using Effects and Transitions: Using Effects, Creating Custom Effects, Using Transitions, Creating Custom Transitions.

UNIT – 8 **6 Hours**

Flex – 5: Working with Data: Using Data Models, Data Binding, Enabling Data Binding for Custom Classes, Data Binding Examples, Building data binding proxies.Validating and Formatting Data: Validating user input, Formatting Data.

Text Books:

1. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2009.
   (Listed topics from Chapters 3, 4, 6, 7, 11, 12)
2. Chafic Kazon and Joey Lott: Programming Flex 3, O'Reilly, June 2009.
   (Listed topics from Chapters 1 to 8, 12 to 15)

Reference Books:

1. Jack Herrington and Emily Kim: Getting Started with Flex 3, O'Reilly, 1st Edition, 2008.
2. Michele E. Davis and John A. Phillips: Flex 3 - A Beginner's Guide, Tata McGraw-Hill, 2008.
3. Colin Moock: Essential Actionscript 3.0, O'Reilly Publications, 2007.
4. Nicholas C Zakas et al : Professional Ajax, Wrox Publications, 2006.

USER INTERFACE DESIGN

Sub Code: 10IS833	**IA Marks : 25**
Hrs/Week: 04	**Exam Hours : 03**
Total Hrs: 52	**Exam Marks : 100**

PART - A

UNIT 1 **8 Hours**

Usability of Interactive Systems: Introduction, Usability Requirements, Usability measures, Usability Motivations, Universal Usability, Goals for our profession

Guideline, principles, and Theories: Introduction, Guidelines, principles, Theories, Object-Action Interface Model

UNIT 2 **5 Hours**

Managing Design Processes: Introduction, Organizational Design to support Usability, The Three pillars of design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

UNIT 3 **7 Hours**

Evaluating Interface Designs: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation During Active Use, Controlled Psychologically Oriented Experiments.

Software Tools: Introduction, Specification Methods, Interface-Building Tools, Evaluation and Critiquing Tools.

UNIT 4 **8 Hours**

Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, 3D Interfaces, Teleoperation, Virtual and Augmented Reality.

Menu Selection, Form Fillin, and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes, and Alternatives, Audio Menus and Menus for small Displays.

PART - B

UNIT 5 **8 Hours**

Command and Natural Languages: Introduction, Functionality to Support User's Tasks, Command-Organization Strategies, The Benefits of Structure, Naming and Abbreviations, Natural Language in Computing.

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large, Printers.

UNIT 6 **6 Hours**

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response Time, Frustrating Experiences.

Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Window Design, Color.

UNIT 7 **5 Hours**

User Manuals, Online Help, and Tutorials: Introduction, Paper versus Online Manuals, Reading from Paper Verses from Displays, Shaping the Content of the Manuals, Online Manuals and Help, Online Tutorials, Demonstrations, and Guides, Online Communities for User Assistance, The Development Process.

UNIT 8 **5 Hours**

Information Search and Visualization: Introduction, Search in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interfaces, Information Visualization

Text Books:

1. Ben Shneiderman: Designing the User Interface, 4th Edition, Pearson Education, 2009.
   (Chapters 1 to 9 and 11 to 14)

Reference Books:

1. Alan J Dix et. al.: Human-Computer Interaction, II Edition, Prentice-Hall India, 1998.
2. Eberts: User Interface Design, Prentice-Hall, 1994.
3. Wilber O Galitz: The Essential Guide to User Interface Design - An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt. Ltd, 1998.

NETWORK MANAGEMENT SYSTEMS

Sub Code	**: 10IS834/10CS834**	**IA Marks**	**: 25**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT 1 **7 Hours**

Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

UNIT 2 **6 Hours**

Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

UNIT 3 **6 Hours**

SNMPv1 Network Management - 1 : Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview.

UNIT 4 **7 Hours**
SNMPv1 Network Management – 2: The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base.The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model

PART - B

UNIT 5 **6 Hours**
SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.

UNIT 6 **6 Hours**
Broadband Network Management: ATM Networks: Broadband Networks and Services, ATM Technology – Virtual Path-Virtual Circuit, TM Packet Size, Integrated Service, SONET, ATM LAN Emulation, Virtual LAN; ATM Network Management – The ATM Network Reference Model, The Integrated Local Management Interface, The ATM Management Information Base, The Role of SNMP and ILMI in ATM Management, M1 Interface: Management of ATM Network Element, M2 Interface: Management of Private Networks, M3 Interface: Customer Network Management of Public Networks, M4 Interface: Public Network Management, Management of LAN Emulation, ATM Digital Exchange Interface Management.

UNIT 7 **6 Hours**
Broadband Network Management: Broadband Access Networks and Technologies – Broadband Access Networks, roadband Access Technology; HFCT Technology – The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles.

UNIT 8 **8 Hours**
Network Management Applications: Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy-Based Management, Service Level Management.

Text Books:

1. Mani Subramanian: Network Management- Principles and Practice, Pearson Education, 2003.

Reference Books:

1. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.

INFORMATION AND NETWORK SECURITY

Subject Code: 10IS835/10CS835	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **6 Hours**
Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan

UNIT 2 **6 Hours**
Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

UNIT 3 **6 Hours**
Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools

UNIT 4 **8 Hours**
Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

PART - B

UNIT 5 **8 Hours**
Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

UNIT 6 **6 Hours**
Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME

UNIT 7 **6 Hours**
IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

UNIT 8 **6 Hours**
Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: Principles of Information Security, 2nd Edition, Thomson, 2005.
   (Chapters 5, 6, 7, 8; Exclude the topics not mentioned in the syllabus)
2. William Stallings: Network Security Essentials: Applications and Standards, Pearson Education, 2000.
   (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:

1. Behrouz A. Forouzan: Cryptography and Network Security, Special Indian Edition, Tata McGraw-Hill, 2007.

MICROCONTROLLER-BASED SYSTEMS

Subject Code: 10IS836/10CS836	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT 1 **7 Hours**
Introduction, 8051 Assembly Language Programming – 1: Microcontrollers and embedded processors; Overview of the 8051 family 8051 Assembly Language Programming (ALP) -1: Inside the 8051; Introduction to 8051 ALP; Assembling and running an 8051 program; The PC and ROM space in 8051; Data types, directives, flag bits, PSW register, register banks, and the stack.

UNIT 2 **6 Hours**
ALP – 2: Jump and loop instructions; Call instructions; Time delay for various 8051 family members; I/O programming; I/O bit manipulation programming. Immediate and register addressing modes; Accessing memory using various addressing modes.

UNIT 3 **7 Hours**
ALP – 3 - Programming in C: Bit addresses for I/O and RAM; Extra 128 bytes of on-chip RAM in 8052.Arithmetic instructions; Signed numbers and arithmetic operations; Logic and compare instructions; rotate instruction and serialization; BCD, ASCII, and other application programs. Programming in C: Data types and time delays; I/O programming; Logic operations; Data conversion programs; Accessing code ROM space; Data serialization.

UNIT 4 **6 Hours**

Pin Description, Timer Programming: Pin description of 8051; Intel Hex file; Programming the 8051 timers; Counter programming; Programming Timers 0 and 1 in C.

PART – B

UNIT 5 **6 Hours**

Serial Port Programming, Interrupt Programming: Basics of serial communications; 8051 connections to RS232; Serial port programming in assembly and in C 8051 interrupts; Programming timer interrupts; Programming external hardware interrupts; Programming the serial communications interrupt; Interrupt priority in 8051 / 8052; Interrupt programming in C.

UNIT 6 **7 Hours**

Interfacing LCD, Keyboard, ADC, DAC and Sensors : LCE interfacing; Keyboard interfacing; Parallel and serial ADC; DAC interfacing; Sensor interfacing and signal conditioning

UNIT 7 **7 Hours**

Interfacing to External Memory, Interfacing with 8255: Memory address decoding; Interfacing 8031 / 8051 with external ROM; 8051 data memory space; Accessing external data memory in C. Interfacing with 8255; Programming 8255 in C.

UNIT 8 **6 Hours**

DS12887 RTC interfacing and Programming, Applications : DS12887 RTC interfacing; DS12887 RTC programming in C; Alarm, SQW, and IRQ features of DS12886 Relays and opto-isolators; Stepper motor interfacing; DC motor interfacing and PWM

Text Books:

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay: The 8051 Microcontroller and Embedded Systems using Assembly and C, 2nd Edition, Pearson Education,2008.

Reference Books:

1. Raj Kamal: Microcontrollers Architecture, Programming, Interfacing and System Design, Pearson Education, 2007.
2. Dr. Ramani Kalpathi, Ganesh Raja: Microcontrollers and Applications, 1st Revised Edition, Sanguine Technical Publishers, 2007.

ADHOC NETWORKS

Sub Code	**: 10IS841/10CS841**	**IA Marks**	**: 25**
Hrs/Week	**: 04**	**Exam Hours**	**: 03**
Total Hrs	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT 1 **6 Hours**

Introduction: Ad hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.

UNIT 2 **7 Hours**

MAC – 1: MAC Protocols for Ad hoc wireless Networks: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms.

UNIT 3 **6 Hours**

MAC – 2: Contention-based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols.

UNIT 4 **7 Hours**

Routing – 1: Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol.

PART- B

UNIT 5 **6 Hours**

Routing – 2: Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols

UNIT 6 **7 Hours**

Transport Layer: Transport layer protocols for Ad hoc wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols for Ad hoc wireless Networks.

UNIT 7 **6 Hours**

Security: Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad hoc wireless Networks.

UNIT 8 **7 Hours**

QoS: Quality of service in Ad hoc wireless Networks: Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions.

Text Books:

1. C. Siva Ram Murthy & B. S. Manoj: Ad hoc Wireless Networks, 2nd Edition, Pearson Education, 2005

Reference Books:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad hoc Wireless Networks, John Wiley, 2006.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad hoc Wireless Networking, Kluwer Academic Publishers, 2004.
3. C.K. Toh: Adhoc Mobile Wireless Networks- Protocols and Systems, Prentice-Hall PTR, 2002.

INFORMATION RETRIEVAL

Subject Code: 10IS842	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT – 1 **7 Hours**

Introduction, Retrieval Strategies – 1: Introduction; Retrieval Strategies: Vector Space Model; Probabilistic Retrieval strategies

UNIT – 2 **6 Hours**

Retrieval Strategies – 2: Some More Retrieval Strategies: Language Models; Inference Networks; Extended Boolean Retrieval; Latent Semantic Indexing; Neural Networks; Genetic Algorithms; Fuzzy Set Retrieval.

UNIT – 3 **7 Hours**

Retrieval Utilities: Relevance feedback; Clustering; Passage-Based Retrieval; N-Grams; Regression Analysis; Thesauri; Semantic Networks; Parsing.

UNIT – 4 **6 Hours**

Indexing and Searching: Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Pattern matching; Structural queries; Compression.

PART – B

UNIT – 5 **6 Hours**

Cross-Language Information Retrieval and Efficiency: Introduction; Crossing the language barrier; Cross-Language retrieval strategies; Cross language utilities. Duplicate Document Detection.

UNIT – 6 **6 Hours**

Integrating Structured Data and Text: Review of the relational model; A historical progression; Information retrieval as a relational application; Semi-structured search using a relational schema; Multi-dimensional data model.

UNIT – 7 **7 Hours**

Parallel Information Retrieval, Distributed Information Retrieval: Parallel text scanning; Parallel indexing; Clustering and classification; Large parallel systems; A theoretic model of distributed information retrieval; Web search; Result fusion; Peer-to-Peer information systems; Other architectures.

UNIT – 8 **7 Hours**

Multimedia IR: Introduction; data modeling; Query languages; Spatial access methods; A general multimedia indexing approach; One-dimensional time series; Two-dimensional color images; Automatic picture extraction.

Text Books:

1. David A. Grossman, Ophir Frieder: Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer, 2004.
   (Chapters 1, 2, 3, 4, 5, 6, 7, 8)
2. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, Pearson Education, 1999
   (Chapters 8, 11, 12)

Reference Books:

1. William B. Frakes, Ricardo Baeza-Yates (Editors): Information Retrieval Data Structures & Algorithms, Prentice Hall PTR, 1992.

SUPPLY CHAIN MANAGEMENT

Subject Code: 10IS843	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT – 1 **6 Hours**
Introduction to Supply Chain, Performance of Supply Chain: What is a Supply Chain; Decision phases in a supply Chain; Process view of a Supply Chain; The importance of Supply Chain Flows; Examples of Supply Chains Competitive and Supply Chain strategies; Achieving strategic fit; Expanding strategic scope.

UNIT – 2 **6 Hours**
Supply Cain drivers and Obstacles, Designing Distribution Network: Drivers of Supply Chain Performance; A framework for structuring drivers; Facilities, Inventory, Transportation, and Information; Obstacles to achieve strategic fit The role of distribution in the Supply Chain; factors influencing distribution network design; Design options for a distribution network; the value of distributors in the Supply Chain; Distribution Networks in practice.

UNIT – 3 **7 Hours**
Network Design: The role of network design in the Supply Chain; Factors influencing Network design Decisions; A framework for Network Design Decisions; Models for facility Location and Capacity Allocation; making Network Design decisions in practice.
The impact of uncertainty on Network design; Discounted cash flow analysis; Representations of uncertainty; Evaluating Network Design decisions using Decision Trees; Making Supply Chain decisions under uncertainty in practice.

UNIT – 4 **7 Hours**
Demand Forecasting, Aggregate Planning: The role of forecasting in a Supply Chain; Characteristics of forecast; Components of a forecast and forecasting methods; Basic approach of Demand forecasting; Time series forecasting methods; Measures of forecast errors; The role of aggregate planning in a supply Chain; The aggregate planning problem; Aggregate planning strategies.

PART – B

UNIT – 5 **6 Hours**
Inventory Management: The role of cycle inventory in a supply Chain; Economies of scale to exploit fixed costs, quantity discounts; Short-term discounting; Managing multi-echelon cycle inventory; Estimating cycle inventory related costs in practice.

UNIT – 6 **7 Hours**
Transportation: The role of transportation in the Supply Chain; Factors affecting transportation decisions; Modes of transportation and their performance characteristics; Design options for a transportation network; Trade-offs in transportation design; Tailored transportation; Routing and scheduling in transportation; Making transportation decisions in practice.

UNIT – 7 **7 Hours**
Pricing and Revenue Management, Coordination : The role of revenue management in Supply Chain; revenue management for multiple customer segments, perishable assets, seasonal demand, and bulk and spot contracts; Using revenue management in practice
Lack of Supply Chain coordination and Bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in the Supply Chain; managerial levers to achieve coordination; Building strategic partnerships and trust within a supply Chain; Achieving coordination in practice.

UNIT – 8 **6 Hours**
IT, Internet and Supply Chain: The role of IT in the Supply Chain; The Supply Chain IT framework; CRM; Internal SCM; Supplier Relationship Management; The transaction management foundation; The future if IT in SCM; Supply Chain It in practice.
The role of E-Business in Supply Chain; The E-Business framework; The B2B addition to the E-Business framework; E-Business in practice

Text Books:

1. Sunil Chopra, Pter Meindl: Supply Chain Management Strategy, Planning, and Operation, 2nd Edition, Prentice-Hall of India, 2004.
   (Chapters 1, 2, 4, 4, 5, 6, 7, 8.1 to 8.3, 10, 14, 15, 16, 17, 18)

Reference Books:

1. David Simchi-Levi, Philp Kaminky, Edith Simchi-Levi: Designing and Managing The Supply Chain Concepts, Strategies & Case Studies, 3rd Edition, Tata McGraw Hill, 2003.

2. R.P. Mohanty, S.G. Deshmukh: Supply Chain Management Theories & Practices, Bizmantra, 2005.
3. Rahul V. Altekar: Supply Chain Management Concepts and Cases, PHI, 2005.
4. M Martin Christopher: Logistics and Supply Chain Management, 2nd Edition, Pearson Education, 1998.

SERVICES ORIENTED ARCHITECTURE

Subject Code: 10IS844/10CS844	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT 1 **7 Hours**

Introduction o SOA, Evolution of SOA: Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA;An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures).

UNIT 2 **6 Hours**

Web Services and Primitive SOA : The Web services framework; Services (as Web services); Service descriptions (with WSDL); Messaging (with SOAP).

UNIT 3 **6 Hours**

Web Services and Contemporary SOA – 1: Message exchange patterns; Service activity; Coordination; Atomic Transactions; Business activities;
Orchestration; Choreography

UNIT 4 **7 Hours**

Web Services and Contemporary SOA – 2: Addressing; Reliable messaging; Correlation; Polices; Metadata exchange; Security; Notification and eventing

PART – B

UNIT 5 **7 Hours**

Principles of Service – Orientation: Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; How service orientation principles inter-relate; Service-orientation and object-orientation; Native Web service support for service-orientation principles.

UNIT 6 **6 Hours**

Service Layers: Service-orientation and contemporary SOA; Service layer abstraction; Application service layer, Business service layer, Orchestration service layer; Agnostic services; Service layer configuration scenarios

UNIT 7 **7 Hours**

Business Process Design: WS-BPEL language basics; WS-Coordination overview; Service-oriented business process design; WS-addressing language basics; WS-Reliable Messaging language basics

UNIT 8 **6 Hours**

SOA Platforms: SOA platform basics; SOA support in J2EE; SOA support in .NET; Integration considerations

Text Books:

1. Thomas Erl: Service-Oriented Architecture – Concepts, Technology, and Design, Pearson Education, 2005.

Reference Books:

1. Eric Newcomer, Greg Lomow: Understanding SOA with Web Services, Pearson education, 2005.

Clouds, Grids, and Clusters

Subject Code: 10IS845/10CS845	**I.A. Marks: 25**
Hours/Week: 4	**Exam Marks: 100**
Total Hours: 52	**Exam Hours: 3**

PART – A

UNIT - 1 **6 Hours**

Introduction: Overview of Cloud Computing, Applications, Intranets and the Cloud, When can cloud Computing be used? Benefits and limitations, Security concerns, Regulatory issues

UNIT - 2 **6 Hours**

Business Case for Cloud, Examples of Cloud Services: Cloud computing services, Help to the business, Deleting the data center. Examples: Google, Microsoft, IBM, Salesforce.com and its uses, Cloud at Thomson Reuters.

UNIT - 3 **7 Hours**

Technology, Cloud Storage, Standards: Cloud Computing Technology: Clients, Security, Network, Services. Overview of Cloud storage, Some providers of Cloud storage. Standards: Applications, Clients, Infrastructure, Service.

UNIT - 4 **7 Hours**

Other issues: Overview of SaaS (Software as a Service), Driving forces, Company offerings: Google, Microsoft, IBM. Software plus Service: Overview, Mobile device integration Local Clouds, Thin Clients, Migrating to the Cloud: Virtualization, Server solutions, Thin clients, Cloud services for individuals, mid-markets, and enterprises, Migration.

PART - B

UNIT - 5 **7 Hours**

GRID Computing – 1: Introduction: Data Center, The Grid and the Distributed/ High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific, Business and e-Governance Grids, Web services and Grid Computing, Business Computing and the Grid – a Potential Win win Situation, e-Governance and the Grid. Technologies and Architectures for Grid Computing: Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing , Recent Technological Trends in Large Data Grids.OGSA and WSRF: OGSA for Resource Distribution, Stateful Web Services in OGSA, WSRF (Web Services Resource Framework), Resource Approach to Stateful Services, WSRF Specification.

The Grid and the Database: Issues in Database Integration with the Grid, The Requirements of a Grid enabled database, Storage Request Broker (SRB), How to integrate the Database with the Grid? The Architecture of OGSA-DAI for Offering Grid Database Services

UNIT - 6 **6 Hours**

GRID Computing – 2: World Wide Grid Computing Activites, Organizations and Projects: Standards Organizations, Organizations Developing Grid Computing Tool Kits, Framework and Middleware, Grid Projects and Organizations Building and Using Grid Based Solutions.Web Services and the Service Oriented Architecture (SOA): History and Background, Service Oriented Architecture, How a Web Service Works, SOAP and WSDL, Description, Creating Web Services, Server Side. Globus Toolkit: History of Globus Toolkit, Versions of Globus Toolkit, Applications of GT4 – cases, GT4 – Approaches and Benefits, Infrastructure Management, Monitoring and Discovery, Security, Data, Choreography and Coordination, Main Features of GT4 Functionality – a Summary, GT4 Architecture, GT4 Command Line Programs, GT4 Containers.

UNIT - 7 **7 Hours**

Cluster Computing – 1: Introduction: What is Cluster Computing, Approaches to Parallel Computing, How to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster, What is the Functionality a Cluster can offer? Categories of Clusters Cluster Middleware: Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools. Early Cluster Architectures and High Throughput Computing Clusters: Early Cluster Architectures, High Throughput Computing Clusters, Condor. Setting up and Administering a Cluster: How to set up a Simple Cluster? Design considerations for the Front End of a Cluster, Setting up nodes, Clusters of Clusters or Metaclusters, System Monitoring, Directory Services inside the Clusters & DCE, Global Clocks Sync, Administering heterogeneous Clusters.

UNIT - 8 **6 Hours**

Cluster Computing – 2: Cluster Technology for High Availability: Highly Available Clusters, High Availability Parallel Computing, Mission Critical (or Business Critical or Business Continuity) Applications, Types of Failures and Errors, Cluster Architectures and Configurations for High Availability, Faults and Error Detection, Failure Recovery, Failover / Recovery Clusters. Performance Model and Simulation: Performance Measures and Metrics, Profit Effectiveness of Parallel Computing through Clusters. Process Scheduling, Load Sharing and Load Balancing: Job Management System (JMS) Resource Management System (RMS), Queues, Hosts, Resources, Jobs and Policies, Policies for Resource Utilization, Scheduling Policies Load Sharing and Load Balancing, Strategies for Load Balancing, Modeling Parameters Case Studies of Cluster Systems: Beowulf, PARAM.

Text Books:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010.
2. Prabhu: Grid and Cluster Computing, PHI, 2007.

Reference Books:

1. Joshy Joseph, Craig Fellenstein: Grid Computing, IBM Press, 2007.
2. Internet Resources

DECISION SUPPORT SYSTEMS

Subject Code: 10IS846	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**

Total Hours : 52 **Exam Marks: 100**

PART - A

UNIT – 1 **6 Hours**

Decision Making and Computerized Support – 1: Managers and Decision Making, Managerial-Decision Making and Information Systems, Managers and Computer Support, Computerized Decision Support and the Supporting technologies, A frame work for decision support, The concept of Decision Support systems, Group Decision Support Systems, Enterprise Information Systems, Knowledge Management systems, Expert Systems, Artificial Neural Networks, Hybrid Support Systems.

Decision-Making Systems, Modeling, and Support: Introduction and Definitions, Systems, Models.

UNIT – 2 **6 Hours**

Decision Making and Computerized Support – 2: Phases of Decision-Making Process, Decision-Making: The Intelligence Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Decision Making: Implementation Phase, How decisions are supported, Personality types, gender, human cognition, and decision styles; The Decision –Makers.

UNIT – 3 **6 Hours**

Decision Support Systems: An Overview: DSS Configuration, What is DSS? Characteristics and Capabilities of DSS, Components of DSS, The Data Management Subsystem, The Model Management Subsystem, The User Interface Subsystem, The Knowledge-Based Management Subsystem, The User, DSS Hardware, DSS Classification.

UNIT – 4 **6 Hours**

Decision Support Systems Development: Introduction to DSS development, The Traditional System Development Life cycle, Alternate Development Methodologies, Prototyping: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User-Developed DSS, Putting the System Together.

PART - B

UNIT – 5 **6 Hours**

Group Support Systems: Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support: Computer- Supported Cooperative work, Group Support Systems, Group Support Systems Technologies, Group Systems Meeting Room and Online, The GSS Meeting Process, Distance Learning, Creativity and Idea Generation.

UNIT – 6 **7 Hours**

Enterprise Information Systems: Concepts and definitions, Evolution of Executive and Enterprise Information Systems, Executive’s roles and information needs, Characteristics and capabilities of Executive Support Systems, Comparing and integrating EIS and DSS, Supply and Value Chains and Decision Support, Supply Chain problems and solutions, MRP, ERP / ERM, SCM, CRM, PLM, BPM, and BAM.

UNIT – 7 **6 Hours**

Knowledge Management: Introduction, Organizational learning and Transformation, Knowledge management initiatives, Approaches to Knowledge management, IT in Knowledge management, Knowledge management systems implications, Role of people in Knowledge management, Ensuring success of Knowledge management.

UNIT – 8 **6 Hours**

Integration, Impacts, and the Future of Management-Support Systems: System Integration: An Overview, Models of MSS integration, Intelligent DSS, Intelligent modeling and model management, Integration with the Web, Enterprise systems, and Knowledge Management, The impact of MSS: An Overview, MSS impacts on organizations, Impact on individuals, Decision-Making and the Manager’s job, Issues of legality, privacy, and ethics, Intelligent Systems and employment levels, Internet communities, Other societal impacts and the Digital Divide, The future of Management-Support Systems.

Text Books:

1. Efraim Turban. Jay E. Aronson, Ting-Peng Liang: Decision Support Systems and Intelligent Systems, 7th Edition, Prentice-Hall of India, 2006.
   (Chapters 1, 2, 3, 6, 7, 8 excluding 8.7 to 8.9, 9, 15)

Reference Books:

1. Sprague R.H. Jr and H.J. Watson: Decision Support Systems, 4th Edition, Prentice Hall, 1996.

Electronics and Communication Engineering

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

(Common to EC/TC/ML)

III SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10MAT31	Engg. Mathematics - III	Mat	04		03	25	100	125
2	10ES32	Analog Electronic Ckts	@	04		03	25	100	125
3	10ES33	Logic Design	@	04		03	25	100	125
4	10ES34	Network Analysis	@	04		03	25	100	125
5	10IT35	Electronic Instrumentation	@	04		03	25	100	125
6	10ES36	Field Theory	@	04		03	25	100	125
7	10ESL37	Analog Electronics Lab	@		03	03	25	50	75
8	10ESL38	Logic Design Lab	@		03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Note : **@** indicates concerned discipline. **ES (for theory) & ECL (for Lab)** in the subject code indicates that the subject is common to electrical and electronics stream consisting of **EE/EC/IT/TC/ML/BM branches** of engineering.

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

(Common to EC/TC/ML)

IV SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10MAT 41	Engg. Mathematics – IV	Mat	04		03	25	100	125
2	10ES 42	Microcontrollers	@	04		03	25	100	125
3	10ES43	Control Systems	@	04		03	25	100	125
4	10EC 44	Signals & Systems	@	04		03	25	100	125
5	10EC45	Fundamentals of HDL	@	04		03	25	100	125
6	10EC46	Linear ICs & Applications	@	04		03	25	100	125
7	10ESL47	Microcontrollers Lab	@		03	03	25	50	75
8	10ECL48	HDL Lab	@		03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Note : **@** indicates concerned discipline. **ES (for theory) & ECL (for Lab)** in the subject code indicates that the subject is common to electrical and electronics stream consisting of **EE/EC/IT/TC/ML/BM branches** of engineering.

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

(Common to EC/TC)

V SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10AL51	Management and Entrepreneurship	@	4	-	3	25	100	125
2	10EC52	Digital Signal Processing	EC	4	-	3	25	100	125
3	10EC53	Analog Communication	EC	4	-	3	25	100	125
4	10EC54	Microwaves and Radar	EC	4	-	3	25	100	125
5	10EC55	Information Theory & Coding	EC	4	-	3	25	100	125
6	10EC56	Fundamentals of CMOS VLSI	EC	4	-	3	25	100	125
7	10ECL57	DSP Lab	EC	-	3	3	25	50	75
8	10ECL58	Analog Communication Lab + LIC Lab	EC	-	3	3	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

@- Any Engineering department or department of Business study.

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

VI SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10EC61	Digital Communication	EC	4	-	3	25	100	125
2	10EC62	Microprocessors	EC	4	-	3	25	100	125
3	10EC63	Microelectronics Circuits	EC	4	-	3	25	100	125
4	10EC64	Antennas and Propagation	EC	4	-	3	25	100	125
5	10EC65	Operating Systems	EC	4		3	25	100	125
6	10EC66x	**Elective-I (Group A)**	EC	4	-	3	25	100	125
7	10ECL67	Advanced Communication Lab	EC	-	3	3	25	50	75
8	10ECL68	Microprocessor Lab	EC	-	3	3	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Elective – I (Group A)			
10EC661	Analog and Mixed Mode VLSI Design	10EC664	Low Power VLSI Design
10EC662	Satellite Communications	10EC665	Data Structure Using C++
10EC663	Random Process	10EC666	Digital System Design Using Verilog
		10EC667	Virtual Instrumentation

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

VII SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10EC71	Computer Communication Networks	EC	4	-	3	25	100	125
2	10EC72	Optical Fiber Communicatio	EC	4	-	3	25	100	125
3	10EC73	Power Electronics	EC	4	-	3	25	100	125
4	10EC74	Embedded System Design	EC	4	-	3	25	100	125
5	10EC75x	**Elective-II (Group B)**	EC	4	-	3	25	100	125
6	10EC76x	**Elective-III (Group C)**	EC	4	-	3	25	100	125
7	10ECL77	VLSI Lab	EC	-	3	3	25	50	75
8	10ECL78	Power Electronics Lab	EC	-	3	3	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Elective – II (Group B)		**Elective – III (Group C)**	
10EC751	DSP Algorithms & Architecture	10EC761	Programming in C++
10EC752	Micro and Smart Systems Technology	10EC762	Real Time Systems
10EC753	Artificial Neural Network	10EC763	Image Processing
10EC754	CAD for VLSI	10EC764	Radio Frequency Integrated Circuits
10EC755	Applied Embedded System Design*	10EC765	Wavelet Transforms
10EC756	Speech Processing	10EC766	Modeling and Simulation of Data Networks

NOTE: * 06EC755 Applied Embedded System Design has a LAB component (syllabus is different and in the Theory Examination, questions from Lab experiments will also be there.)

SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRONICS & COMMUNICATION ENGINEERING

VIII SEMESTER

Sl. No	Subject Code	Title	Teaching Dept.	Teaching Hours /Week		Examination			
				Theory	Practical/ Drawing	Dura-tion	I.A. Marks	Theory/ Practical Marks	Total Marks
1	10EC81	Wireless Communication	EC	4	-	3	25	100	125
2	10EC82	Digital Switching Systems	EC	4	-	3	25	100	125
3	10EC83x	**Elective-IV (Group D)**	EC	4	-	3	25	100	125
4	10EC84x	**Elective-V (Group E)**	EC	4	-	3	25	100	125
5	10ECP85	Project Work	EC	-	6	3	100	100	200
6	10ECS86	Seminar	EC	-	3	-	50	-	50
TOTAL				**16**	**09**	**15**	**250**	**500**	**750**

Elective – IV (Group D)		**Elective – V (Group E)**	
10EC831	Distributed Systems	10EE841	Multimedia Communication
10EC832	Network Security	10EC842	Real Time Operating Systems
10EC833	Optical Networks	10EC843	GSM
10EC834	High Performance Computing Networks	10EC844	Ad-hoc Wireless Networks
10EC835	Internet Engineering	10EC845	Optical Computing

III SEMESTER

ENGINEERING MATHEMATICS – III

Sub Code	**:**	**10MAT31**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A

UNIT-1

Fourier series

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*

Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis.

7 Hours

UNIT-2

Fourier Transforms

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms

6 Hours

UNIT-3

Application of PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.

6 Hours

UNIT-4

Curve Fitting and Optimisation

Curve fitting by the method of least squares- Fitting of curves of the form

$y = ax+b, \quad y = a x^2 + b x + c, \; y = a e^{bx}, \; y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

7 Hours

PART-B

UNIT-5

Numerical Methods - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

6 Hours

UNIT-6

Numerical Methods – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

7 Hours

UNIT-7

Numerical Methods – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations

7 Hours

UNIT-8

Difference Equations and Z-Transorms

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

6 Hours

Note: * In the case of illustrative examples, questions are not to be set.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

REFERENCE BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. **6 Hours**

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers. **4 Hours**

UNIT 6:
Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:
Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators. **6 Hours**

UNIT 8:
FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9^{TH} Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2^{nd} Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4^{th} Edition, 2004
3. "**Analog Electronics Circuits: A Simplified Approach"**, U.B. Mahadevaswamy, Pearson/Saguine, 2007.

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables,

Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. **6 Hours**

UNIT 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables. **7 Hours**

UNIT 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. **6 Hours**

UNIT 4:

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators. Adders and subtractors- Cascading full adders, Look ahead carry, Binary comparators. Design methods of building blocks of combinational logics.

7 Hours

PART – B

UNIT 5:

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. **7 Hours**

UNIT 6:

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops **7 Hours**

UNIT 7:

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis and Design.

6 Hours

UNIT 8:
Sequential Design - II: Construction of state Diagrams, Counter Design.
6 Hours

TEXT BOOKS:
1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:
1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. **7 Hours**
UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.** **7 Hours**
UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems. **6 Hours**

UNIT 4:
Network Theorems - II:
Thevinin's and Norton's theorems; Maximum Power transfer theorem . **6 Hours**

PART – B

UNIT 5: Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.
7 Hours

UNIT 6:
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.
7 Hours

UNIT 7:
Laplace Transformation & Applications : Solution of networks, step, ramp and impulse responses, waveform Synthesis. **6 Hours**

UNIT 8:
Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets. **6 Hours**

TEXT BOOKS:

1. **"Network Analysis",** M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition. Reprint 2002.
2. **"Networks and systems",** Roy Choudhury, 2nd edition, 2006 re-print, New Age International Publications.

REFERENCE BOOKS:

1. **"Engineering Circuit Analysis",** Hayt, Kemmerly and DurbinTMH 7th Edition, 2010
2. **"Basic Engineering Circuit Analysis"**, J. David Irwin / R. Mark Nelms, John Wiley, 8th ed, 2006.
3. 3.**" Fundamentals of Electric Circuits"**, Charles K Alexander and Mathew N O Sadiku, Tata McGraw-Hill, 3 ed, 2009.

ELECTRONIC INSTRUMENTATION
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10IT35**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT – 1:
Introduction
(a) Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.
(b) Voltmeters and Multimeters Introduction, Multirange voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.
3 + 4 Hours

UNIT – 2:
Digital Instruments
Digital Voltmeters – Introduction, DVM's based on V – T, V – F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time. **6 Hours**

UNIT – 3:
Oscilloscopes
Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch. **6 Hours**

UNIT – 4:
Special Oscilloscopes
Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes. **6 Hours**

PART – B

UNIT – 5:
Signal Generators
Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator,

Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer. **6 Hours**

UNIT – 6:

Measurement of resistance, inductance and capacitance

Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection

5 Hours

UNIT – 7:

Transducers - I

Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT. **6 Hours**

UNIT – 8:

Miscellaneous Topics

(a) Transducers - II –Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple .

(b) Display devices: Digital display system, classification of display, Display devices, LEDs, LCD displays.

(c) Bolometer and RF power measurement using Bolometer

(d) Introduction to Signal conditioning.

(e) Introduction to LabView. **10 Hours**

TEXT BOOKS:

1. **"Electronic Instrumentation",** H. S. Kalsi, TMH, 3rd 2010.
2. **"Electronic Instrumentation and Measurements",** David A Bell, PHI / Pearson Education, 2006.

REFERENCE BOOKS:

1. **"Principles of measurement systems",** John P. Beately, 3rd Edition, Pearson Education, 2000
2. **"Modern electronic instrumentation and measuring techniques",** Cooper D & A D Helfrick, PHI, 1998.
3. **Electronics & electrical measurements,** A K Sawhney, , Dhanpat Rai & sons, 9th edition.

FIELD THEORY
(Common to EC/TC/ML/EE)

Sub Code	**:**	**10ES36**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
a. Coulomb's Law and electric field intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge. **3 Hours**

b. **Electric flux density, Gauss' law and divergence:** Electric flux density, Gauss' law, Divergence, Maxwell's First equation(Electrostatics), vector operator ∇ and divergence theorem. **3 Hours**

UNIT 2:
a. **Energy and potential :** Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field. **4 Hours**

b. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples. **4 Hours**

UNIT 3:
Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations. **6 Hours**

UNIT 4:
The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials. **6 Hours**

PART – B

UNIT 5:

a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit. **4 Hours**

b. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance. **4 Hours**

UNIT 6:

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equation in point and Integral form, retarded potentials. **6 Hours**

UNIT 7:

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors – (skin effect). **6 Hours**

UNIT 8:

Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions. **6 Hours**

TEXT BOOK:

1**. "Engineering Electromagnetics",** William H Hayt Jr. and John A Buck**,** Tata McGraw-Hill, 7th edition, 2006.

REFERENCE BOOKS:

1. **"Electromagnetics with Applications",** John Krauss and Daniel A Fleisch, McGraw-Hill, 5th edition, 1999.
2. **"Electromagnetic Waves And Radiating Systems,"** Edward C. Jordan and Keith G Balmain, Prentice – Hall of India / Pearson Education, 2nd edition, 1968.Reprint 2002.
3. **"Field and Wave Electromagnetics",** David K Cheng, Pearson Education Asia, 2nd edition, - 1989, Indian Reprint – 2001.

ANALOG ELECTRONICS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL37**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

NOTE: Use the Discrete components to test the circuits. LabView can be used for the verification and testing along with the above.

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain-frequency response, input and output impedances.

2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)

3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)

4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz

5. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range $f_0 \geq 100$KHz.

6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz
7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection

8. Testing of Clamping circuits: positive clamping /negative clamping.
9. Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.

10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.

12. Characteristics of Series and Parallel resonant circuits.

LOGIC DESIGN LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL38**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

NOTE: Use discrete components to test and verify the logic gates. LabView can be used for designing the gates along with the above.

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip
   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Wiring and testing Ring counter/Johnson counter.
12. Wiring and testing of Sequence generator.

IV SEMESTER

ENGINEERING MATHEMATICS - IV

Sub Code	**:**	**10MAT41**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Numerical Methods

Numerical solutions of first order and first degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge – Kutta method of fourth order, Milne's and Adams-Bashforth predictor and corrector methods (All formulae without Proof).

UNIT 2:

Complex Variables

Function of a complex variable, Limit, Continuity Differentiability – Definitions. Analytic functions, Cauchy – Riemann equations in cartesian and polar forms, Properties of analytic functions. Conformal Transformation – Definition. Discussion of transformations: $W = z^2$, $W = e^z$, $W = z + (I/z)$, $z \neq 0$ Bilinear transformations.

UNIT 3:

Complex Integration

Complex line integrals, Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only) Singularities, Poles, Residues, Cauchy's residue theorem (statement only).

UNIT 4:

Series solution of Ordinary Differential Equations and Special Functions

Series solution – Frobenius method, Series solution of Bessel's D.E. leading to Bessel function of fist kind. Equations reducible to Bessel's D.E., Series solution of Legendre's D.E. leading to Legendre Polynomials. Rodirgue's formula.

PART – B

UNIT 5:

Statistical Methods

Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ax^b$ $y = ab^x$, $y = ae^{bx}$, Correlation and Regression.

Probability: Addition rule, Conditional probability, Multiplication rule, Baye's theorem.

UNIT 6:
Random Variables (Discrete and Continuous) p.d.f., c.d.f. Binomial, Poisson, Normal and Exponential distributions.

UNIT 7:
Sampling, Sampling distribution, Standard error. Testing of hypothesis for means. Confidence limits for means, Student's t distribution, Chi-square distribution as a test of goodness of fit.

UNIT 8:
Concept of joint probability – Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient.
Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states.

TEXT BOOK:

1. **Higher Engineering Mathematics** by Dr. B.S. Grewal, 36th Edn. Kanna Publications.
2. **Probability** by Seymour Lipschutz (Schaum's series).

REFERENCE BOOKS:

1. **Higher Engineering Mathematics** by B.V. Ramana (Tata-Macgraw Hill).
2. **Advanced Modern Engineering Mathematics** by Glyn James – Pearson Education.

MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.
Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6 Hours

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations. **6 Hours**

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

7 Hours

PART – B

UNIT 5:
8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C . **6 Hours**

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.

8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

6 Hours

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

3 Hours

Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. **"The 8051 Microcontroller and Embedded Systems – using assembly and C "-,** Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. **"MSP430 Microcontroller Basics",** John Davies, Elsevier, 2010 (Indian edition available)

REFERENCE BOOKS:

1. **"The 8051 Microcontroller Architecture, Programming & Applications",** 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. "**The 8051 Microcontroller",** V.Udayashankar and MalikarjunaSwamy, TMH, 2009
3. **MSP430 Teaching CD-ROM,** Texas Instruments, 2008 (can be requested **http://www.uniti.in**)
4. **Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005

CONTROL SYSTEMS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems. **7 Hours**

UNIT 2:

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded), **6 Hours**

UNIT 3:

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PID Controllers(excluding design) **7 Hours**

UNIT 4:

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion. **6 Hours**

PART – B

UNIT 5:

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci. **6 Hours**

UNIT 6:

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design). **7 Hours**

UNIT 7:

Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded). **7 Hours**

UNIT 8:

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

6 Hours

TEXT BOOK :

1. **J. Nagarath and M.Gopal**, “Control Systems Engineering”, New Age International (P) Limited, Publishers, Fourth edition – 2005.

REFERENCE BOOKS:

1. **“Modern Control Engineering “,** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.

2. **"Automatic Control Systems",** Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8^{th} Edition, 2008.
3. **"Feedback and Control System",** Joseph J Distefano III et al., Schaum's Outlines, TMH, 2^{nd} Edition 2007.

SIGNALS & SYSTEMS
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems. **6 Hours**

UNIT 2:
Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum and Convolution Integral.
6 Hours

UNIT 3:
Time-domain representations for LTI systems – 2: Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations. **7 Hours**

UNIT 4:
Fourier representation for signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties . **7 Hours**

PART – B

UNIT 5:
Fourier representation for signals – 2: Discrete and continuous Fourier transforms(derivations of transforms are excluded) and their properties.
6 Hours

UNIT 6:
Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier

transform representation of discrete time signals. Sampling theorm and Nyquist rate. **7 Hours**

UNIT 7:

Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

6 Hours

UNIT 8:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations. **6 Hours**

TEXT BOOK

1. **Simon Haykin,** "Signals and Systems", John Wiley India Pvt. Ltd., 2nd Edn, 2008.
2. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd ed, Tata McGraw-Hill, 2010.

REFERENCE BOOKS:

1. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
2. **H. P Hsu, R. Ranjan**, "Signals and Systems", Scham's outlines, TMH, 2006.
3. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
4. **Ganesh Rao and Satish Tunga**, "Signals and Systems", Pearson/Sanguine Technical Publishers, 2004.

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

7 Hours

UNIT 2:
Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. **6 Hours**

UNIT 3:
Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. **6 Hours**

UNIT 4:
Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

7 Hours

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing
7 Hours

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples
6 Hours

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.
7 Hours

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.
6 Hours

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog**)- Nazeih M.Botros- John Weily India Pvt. Ltd. 2008.

REFERENCE BOOKS:
1. **Fundamentals of HDL –** Cyril P.R. Pearson/Sanguin 2010.
2. **VHDL** -Douglas perry-Tata McGraw-Hill.
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI.

LINEAR IC's & APPLICATIONS
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC46**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Operational Amplifier Fundamentals: Basic Op-Amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations; Op-Amps as DC Amplifiers- Biasing Op-Amps, Direct coupled -Voltage Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier. **7 Hours**

UNIT 2:
Op-Amps as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance - Capacitor coupled Voltage Follower, Capacitor coupled Non-inverting Amplifiers, High input impedance - Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Inverting amplifiers, setting the upper cut-off frequency, Capacitor coupled Difference amplifier, Use of a single polarity power supply. **7 Hours**

UNIT 3:
Op-Amps frequency response and compensation: Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects, Z_{in} Mod compensation, and circuit stability precautions. **6 Hours**

UNIT 4:
OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier, precision rectifiers, Limiting circuits. **6 Hours**

PART – B

UNIT 5:
More applications: Clamping circuits, Peak detectors, sample and hold circuits, V to I and I to V converters, Log and antilog amplifiers, Multiplier

and divider, Triangular / rectangular wave generators, Wave form generator design, phase shift oscillator, Wein bridge oscillator.

7 Hours

UNIT 6:

Non-linear circuit applications: crossing detectors, inverting Schmitt trigger circuits, Monostable & Astable multivibrator, Active Filters **–**First and second order Low pass & High pass filters. **6 Hours**

UNIT 7:

Voltage Regulators: Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purpose regulator, Switching regulator.

6 Hours

UNIT 8:

Other Linear IC applications: 555 timer - Basic timer circuit, 555 timer used as astable and monostable multivibrator, Schmitt trigger; PLL-operating principles, Phase detector / comparator, VCO; D/A and A/ D converters – Basic DAC Techniques, AD converters. **7 Hours**

TEXT BOOKS:

1. **"Operational Amplifiers and Linear IC's",** David A. Bell**,** 2nd edition, PHI/Pearson, 2004.
2. **"Linear Integrated Circuits",** D. Roy Choudhury and Shail B. Jain**,** 2nd edition, Reprint 2006, New Age International.

REFERENCE BOOKS:

1. **"Opamps- Design, Applications and Trouble Shooting",** Terrell, Elsevier, 3rd ed. 2006.
2. **"Operational Amplifiers",** George Clayton and Steve Winder, Elsever
3. 5th ed., 2008.
4. **"Operational Amplifiers and Linear Integrated Circuits",** Robert. F. Coughlin & Fred.F. Driscoll**,** PHI/Pearson, 2006.
5. **"Design with Operational Amplifiers and Analog Integrated Circuits",** Sergio Franco**,** TMH, 3e, 2005.

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

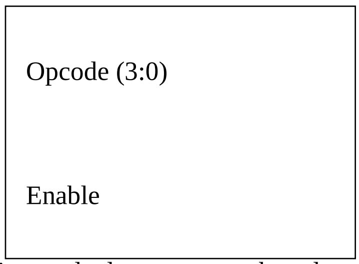
Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

<u>PROGRAMMING (using VHDL /Verilog)</u>

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below
A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

V SEMESTER
MANAGEMENT & ENTREPRENEURSHIP

Subject Code	: **10AL51**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

MANAGEMENT (PART – A)

UNIT - 1

MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of Management - Management as a Science, Art or Profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought-Early Management Approaches-Modern Management Approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

ORGANISING AND STAFFING: Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – Centralisation Vs Decentralisation of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief).

7 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control. **6 Hours**

ENTREPRENEURSHIP (PART – B)

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers. **6 Hours**

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I., Effect of WTO/GATT Supporting Agencies of Government for S.S.I Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only). **7 Hours**

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC. **6 Hours**

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities - Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study. **7 Hours**

TEXT BOOKS:

1. **Principles of Management** - P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4^{th} Edition, 2010.
2. **Dynamics of Entrepreneurial Development & Management** - Vasant Desai Himalaya Publishing House.
3. **Entrepreneurship Development** - Small Business Enterprises - Poornima M Charantimath - Pearson Education – 2006.

REFERENCE BOOKS:

1. **Management Fundamentals** - Concepts, Application, Skill Development Robert Lusier – Thomson.
2. **Entrepreneurship Development** - S S Khanka - S Chand & Co.
3. **Management** - Stephen Robbins - Pearson Education /PHI -17^{th} Edition, 2003.

DIGITAL SIGNAL PROCESSING

Subject Code	: **10EC52**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms. **6 Hours**

UNIT - 2

Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties. **6 Hours**

UNIT - 3

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms). **7 Hours**

UNIT - 4

Radix-2 FFT algorithm for the computation of DFT and IDFT–decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform. **7 Hours**

PART – B

UNIT - 5

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebysheve filters, analog to analog frequency transformations. **6 Hours**

UNIT - 6

Implementation of discrete-time systems: Structures for IIR and FIR systems- direct form I and direct form II systems, cascade, lattice and parallel realization. **7 Hours**

UNIT - 7

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique. **6 Hours**

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

7 Hours

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsivier publications, 2007

ANALOG COMMUNICATION

Subject Code	: **10EC53**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process. **7 Hours**

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

7 Hours

UNIT - 3

SINGLE SIDE-BAND MODULATION (SSB): Quadrature carrier multiplexing, Hilbert transform, properties of Hilbert transform, Pre-envelope, Canonical representation of band pass signals, Single side-band modulation, Frequency-Domain description of SSB wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB waves. **6 Hours**

UNIT - 4

VESTIGIAL SIDE-BAND MODULATION (VSB): Frequency – Domain description, Generation of VSB modulated wave, Time - Domain description, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: Radio broadcasting, AM radio. **6 Hours**

PART – B

UNIT - 5

ANGLE MODULATION (FM)-I: Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM. **6 Hours**

UNIT - 6

ANGLE MODULATION (FM)-II: Demodulation of FM waves, FM stereo multiplexing, Phase-locked loop, Nonlinear model of the phase – locked loop, Linear model of the phase – locked loop, Nonlinear effects in FM systems.

7 Hours

UNIT - 7

NOISE: Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks. **6 Hours**

UNIT - 8

NOISE IN CONTINUOUS WAVE MODULATION SYSTEMS: Introduction, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM,.

7 Hours

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5^{th} Edition, John Willey, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4^{th} ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems**: Singh and Sapre**:** Analog and digital TMH 2^{nd} , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: **10EC54**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

7 Hours

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

6 Hours

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers

Other diodes: PIN diodes, Schottky barrier diodes. **7 Hours**

UNIT - 4

Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks. **6 Hours**

PART – B

UNIT - 5

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees. **6 Hours**

UNIT - 6

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines. **6 Hours**

UNIT - 7

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar. **7 Hours**

UNIT - 8

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar. **7 Hours**

TEXT BOOKS:

1. **Microwave Devices and circuits**- Liao / Pearson Education.
2. **Introduction to Radar systems**-Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd , 2010.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: **10EC55**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INFORMATION THEORY: Introduction, 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. **7 Hours**

UNIT - 2

SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. **6 Hours**

UNIT - 3

FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity. **7 Hours**

UNIT - 4

Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem. **6 Hours**

PART – B

UNIT - 5

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. **7 Hours**

UNIT - 6

Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. **6 Hours**

UNIT - 7

RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. **7 Hours**

UNIT - 8

Convolution Codes, Time domain approach. Transform domain approach. **6 Hours**

TEXT BOOKS:

1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant**;** Pearson Ed. 2nd Ed 2008.

FUNDAMENTALS OF CMOS VLSI

Subject Code	: **10EC56**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

BASIC MOS TECHNOLOGY: Integrated circuit's era. Enhancement and depletion mode MOS transistors. nMOS fabrication. CMOS fabrication. Thermal aspects of processing. BiCMOS technology. Production of E-beam masks. **3 Hours**

MOS TRANSISTOR THEORY: Introduction, MOS Device Design Equations, The Complementary CMOS Inverter – DC Characteristics, Static Load MOS Inverters, The Differential Inverter, The Transmission Gate, Tristate Inverter**.** **4 Hours**

UNIT - 2

CIRCUIT DESIGN PROCESSES: MOS layers. Stick diagrams. Design rules and layout – lambda-based design and other rules. Examples. Layout diagrams. Symbolic diagrams. Tutorial exercises. **4 Hours**

Basic Physical Design of Simple logic gates. **3 Hours**

UNIT - 3

CMOS LOGIC STRUCTURES: CMOS Complementary Logic, Bi CMOS Logic, Pseudo-nMOS Logic, Dynamic CMOS Logic, Clocked CMOS Logic, Pass Transistor Logic, CMOS Domino Logic Cascaded Voltage Switch Logic (CVSL). **6 Hours**

UNIT - 4

BASIC CIRCUIT CONCEPTS: Sheet resistance. Area capacitances. Capacitance calculations. The delay unit. Inverter delays. Driving capacitive loads. Propagation delays. Wiring capacitances. **3 Hours**

SCALING OF MOS CIRCUITS: Scaling models and factors. Limits on scaling. Limits due to current density and noise. **3 Hours**

PART – B

UNIT - 5

CMOS SUBSYSTEM DESIGN: Architectural issues. Switch logic. Gate logic. Design examples – combinational logic. Clocked circuits. Other system considerations. **5 Hours**

Clocking Strategies **2 Hours**

UNIT - 6

CMOS SUBSYSTEM DESIGN PROCESSES: General considerations. Process illustration. ALU subsystem. Adders. Multipliers. **6 Hours**

UNIT - 7

MEMORY, REGISTERS AND CLOCK: Timing considerations. Memory elements. Memory cell arrays. **6 Hours**

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

7 Hours

TEXT BOOKS:

1. **CMOS VLSI Design – A Circuits and Systems Perspective. 3rd Edition. N.H. Weste and David Harris. Addison-Wesley, 2005. (Refer to** http://www.cmosvlsi.com**).**
2. **Principles of CMOS VLSI Design: A Systems Perspective**, Neil H. E. Weste, K. Eshragian, and ??? 3rd edition, Pearson Education (Asia) Pvt. Ltd., 200?. (Shift to the latest edition.).
3. **Basic VLSI Design** - Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994), 2005.

REFERENCE BOOKS:

1. R. Jacob Baker. CMOS Circuit Design, Layout and Simulation. John Wiley India Pvt. Ltd, 2008.
2. **Fundamentals of Semiconductor Devices**, M. K. Achuthan and K. N. Bhat, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. **CMOS Digital Integrated Circuits: Analysis and Design**, Sung-Mo Kang & Yusuf Leblebici, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4. **Analysis and Design of Digital Integrated Circuits** - D.A Hodges, H.G Jackson and R.A Saleh. 3rd Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code	: **10ECL57**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

3. Verification of Sampling theorem.
4. Impulse response of a given system
5. Linear convolution of two given sequences.
6. Circular convolution of two given sequences

7. Autocorrelation of a given sequence and verification of its properties.
8. Cross correlation of given sequences and verification of its properties.
9. Solving a given difference equation.
10. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
11. Linear convolution of two sequences using DFT and IDFT.
12. Circular convolution of two given sequences using DFT and IDFT
13. Design and implementation of FIR filter to meet given specifications.
14. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1.Linear convolution of two given sequences.
2.Circular convolution of two given sequences.
3.Computation of N- Point DFT of a given sequence
4.Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5.Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6.Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7.Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000
3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH,2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: **10ECL58**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW - 2009 CAN BE USED FOR VERIFICATION AND TESTING.

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP

4. Frequency synthesis using PLL.
5. Design and test R-2R DAC using op-amp
6. Design and test the following circuits using IC 555
    a. Astable multivibrator for given frequency and duty cycle
    b. Monostable multivibrator for given pulse width W
7. IF amplifier design
8. Amplitude modulation using transistor/FET (Generation and detection)
9. Pulse amplitude modulation and detection
10. PWM and PPM
11. Frequency modulation using 8038/2206
12. Precision rectifiers – both Full Wave and Half Wave.

VI SEMESTER

DIGITAL COMMUNICATION

Subject Code	: **10EC61**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery. **7 Hours**

UNIT - 2
PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hours**

UNIT - 3
DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals. **7 Hours**

UNIT - 4
ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission. **6 Hours**

PART – B

UNIT - 5
DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **6 Hours**

UNIT - 6
Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input. **6 Hours**

UNIT - 7
Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise. **7 Hours**

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency hop spread spectrum, applications. **7 Hours**

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems,** Simon Haykin, John Wildy India Lts, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: **10EC62**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing. **6 Hours**

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators. **6 Hours**

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display. **7 Hours**

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples.

7 Hours

PART – B

UNIT - 5

8086 INTERFACING: Interfacing microprocessor to keyboard (keyboard types, keyboard circuit connections and interfacing, software keyboard interfacing, keyboard interfacing with hardware), Interfacing to alphanumeric displays (interfacing LED displays to microcomputer), Interfacing a microcomputer to a stepper motor. **7 Hours**

UNIT - 6

8086 BASED MULTIPROCESSING SYSTEMS: Coprocessor configurations, The 8087 numeric data processor: data types, processor architecture, instruction set and examples. **6 Hours**

UNIT - 7

SYSTEM BUS STRUCTURE: Basic 8086 configurations: minimum mode, maximum mode, Bus Interface: peripheral component interconnect (PCI) bus, the parallel printer interface (LPT), the universal serial bus (USB)

6 Hours

UNIT - 8

80386, 80486 AND PENTIUM PROCESSORS: Introduction to the 80386 microprocessor, Special 80386 registers, Introduction to the 80486 microprocessor, Introduction to the Pentium microprocessor. **7 Hours**

TEXT BOOKS:

1. **Microcomputer systems-The 8086 / 8088** Family – Y.C. Liu and G. A. Gibson, 2E PHI -2003
2. **The Intel Microprocessor, Architecture, Programming and Interfacing**-Barry B. Brey, 6e, Pearson Education / PHI, 2003

REFERENCE BOOKS:

1. **Microprocessor and Interfacing- Programming & Hardware**, Douglas hall, 2nd , TMH, 2006.
2. **Advanced Microprocessors and Peripherals** - A.K. Ray and K.M. Bhurchandi, TMH, 2nd , 2006.
3. **8088 and 8086 Microprocessors - Programming, Interfacing, Software, Hardware & Applications** - Triebel and Avtar Singh, 4e, Pearson Education, 2003

MICROELECTRONICS CIRCUITS

Subject Code	: **10EC63**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1
MOSFETS: Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation modes, single stage MOS amplifiers. MOSFET internal capacitances and high frequency modes, Frequency response of CS amplifiers, CMOS digital logic inverter, detection type MOSFET. **7 Hours**

UNIT -2
Single Stage IC Amplifier: IC Design philiosophy, CoUmparison of MOSFET and BJT, Current sources, Current mirrors and Current steering circuits, high frequency response. **6 Hours**

UNIT – 3
Single Stage IC amplifiers (continued): CS and CF amplifiers with loads, high frequency response of CS and CF amplifiers, CG and CB amplifiers with active loads, high frequency response of CG and CB amplifiers, Cascade amplifiers. CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance. SPICE examples.

6 Hours

UNIT – 4
Differences and Multistage Amplifiers: The MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, Differential amplifier with active loads, frequency response and differential amplifiers. Multistage amplifier. SPICE examples.

7 Hours

PART – B

UNIT – 5
Feedback. General Feedback structure. Properties of negative feedback. Four basic feedback topologies. Series-Shunt feedback. Determining the loop gain.

Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples. **7 Hours**

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters. **6 Hours**

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples. **12 Hours**

TEXT BOOK:

1. **"Microelectronic Circuits",** Adel Sedra and K.C. Smith, 5th Edition, Oxford University Press, Interantional Version, 2009.

REFERENCE BOOK:

1. "**Fundamentals of Microelectronics**" , Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. **"Microelectronics – Analysis and Design"**, Sundaram Natarajan,
3. Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: **10EC64**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

7 Hours

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

6 Hours

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of lambda/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas. **7 Hours**

UNIT - 4

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet's principle and complementary antennas, impedance of complementary and slot antennas, patch antennas.

8 Hours

PART – B

UNIT – 5 & 6

ANTENNA TYPES: Horn antennas, rectangular horn antennas, Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

12 Hours

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.

TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field. **10 Hours**

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn,McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007.

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008.
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation -** G S N Raju: Pearson Education 2005.

OPERATING SYSTEMS

Subject Code	: **10EC65**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **6 Hours**

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hours**

UNIT - 3
PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris**.** **6 Hours**

UNIT - 4
MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation. **7 Hours**

PART – B

UNIT - 5
VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.
6 Hours

UNIT - 6
FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **7 Hours**

UNIT - 7
SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hours**

UNIT - 8
MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX. 7 Hours

TEXT BOOK:

1. **"Operating Systems - A Concept based Approach"**, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems,** Tennambhaum, TMH, 2001.

ADVANCED COMMUNICATION LAB

Subject Code	: **10ECL67**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs. : 42		Exam Marks	: 50

LIST OF EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW – 2009 can be used for verification and testing.

1. TDM of two band limited signals.
2. ASK and FSK generation and detection
3. PSK generation and detection
4. DPSK generation and detection
5. QPSK generation and detection
6. PCM generation and detection using a CODEC Chip
7. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
8. Analog and Digital (with TDM) communication link using optical fiber.
9. Measurement of frequency, guide wavelength, power, VSWR and attenuation in a microwave test bench
10. Measurement of directivity and gain of antennas: Standard dipole (or printed dipole), microstrip patch antenna and Yagi antenna (printed).
11. Determination of coupling and isolation characteristics of a stripline (or microstrip) directional coupler
12. (a) Measurement of resonance characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate. (b) Measurement of power division and isolation characteristics of a microstrip 3 dB power divider.

MICROPROCESSOR LAB

Subject Code	: **10ECL68**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs. : 42		Exam Marks	: 50

I) **Programs involving**

1) Data transfer instructions like:
   - i] Byte and word data transfer in different addressing modes.

ii] Block move (with and without overlap)
iii] Block interchange

2) Arithmetic & logical operations like:
   i] Addition and Subtraction of multi precision nos.
   ii] Multiplication and Division of signed and unsigned Hexadecimal nos.
   iii] ASCII adjustment instructions
   iv] Code conversions
   v] Arithmetic programs to find square cube, LCM, GCD, factorial

3) Bit manipulation instructions like checking:
   i] Whether given data is positive or negative
   ii] Whether given data is odd or even
   iii] Logical 1's and 0's in a given data
   iv] 2 out 5 code
   v] Bit wise and nibble wise palindrome

4) Branch/Loop instructions like:
   i] Arrays: addition/subtraction of N nos.
   Finding largest and smallest nos.
   Ascending and descending order
   ii] Near and Far Conditional and Unconditional jumps, Calls and Returns

5) Programs on String manipulation like string transfer, string reversing, searching for a string, etc.

6) Programs involving Software interrupts
   Programs to use DOS interrupt INT 21h Function calls for Reading a Character from keyboard, Buffered Keyboard input, Display of character/ String on console

II) Experiments on interfacing 8086 with the following interfacing modules through DIO (Digital Input/Output-PCI bus compatible) card
   a) Matrix keyboard interfacing
   b) Seven segment display interface
   c) Logical controller interface
   d) Stepper motor interface

III) Other Interfacing Programs
   a) Interfacing a printer to an X86 microcomputer
   b) PC to PC Communication

ELECTIVE – I (GROUP A)

ANALOG AND MIXED MODE VLSI DESIGN

Subject Code	: **10EC661**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

(Text Book 1)

UNIT 1

Data converter fundamentals: Analog versus Digital Discrete Time Signals, Converting Analog Signals to Data Signals, Sample and Hold Characteristics, DAC Specifications, ADC Specifications, Mixed-Signal Layout Issues.

7 Hours

UNIT 2

Data Converters Architectures: DAC Architectures, Digital Input Code, Resistors String, R-2R Ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC, ADC Architectures, Flash, 2-Step Flash ADC, Pipeline ADC, Integrating ADC, Successive Approximation ADC.

12 Hours

UNIT 3

Non-Linear Analog Circuits: Basic CMOS Comparator Design (Excluding Characterization), Analog Multipliers, Multiplying Quad (Excluding Stimulation), Level Shifting (Excluding Input Level Shifting For Multiplier).

7 Hours

(Text Book 2)

UNIT 4:

Data Converter SNR: Improving SNR Using Averaging (Excluding Jitter & Averaging onwards), Decimating Filters for ADCs (Excluding Decimating without Averaging onwards), Interpolating Filters for DAC, Band pass and High pass Sync filters. **8 Hours**

UNIT 5

Su-Microns CMOS circuit design: Process Flow, Capacitors and Resistors, MOSFET Switch (upto Bidirectional Switches), Delay and adder Elements, Analog Circuits MOSFET Biasing (upto MOSFET Transition Frequency).

10 Hours

UNIT 6

OPAmp Design (Excluding Circuits Noise onwards) **8 Hours**

TEXT BOOK:

1. **Design, Layout, Stimulation ,**R. Jacob Baker, Harry W Li, David E Boyce, CMOS Circuit, PHI Education, 2005.
2. **CMOS- Mixed Signal Circuit Design ,**R. Jacob Baker, (Vol II of CMOS: Circuit Design, Layout and Stimulation), John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Design of Analog CMOS Integrated Circuits**, B Razavi,First Edition, McGraw Hill,2001.
2. **CMOS Analog Circuit Design**, P e Allen and D R Holberg, 2nd
3. Edition, Oxford University Press,2002.

SATELLITE COMMUNICATION

Subject Code	: **10EC662**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

OVER VIEW OF SATELLITE SYSTEMS: Introduction, frequency allocation, INTEL Sat. **6 Hours**

UNIT - 2

ORBITS: Introduction, Kepler laws, definitions, orbital element, apogee and perigee heights, orbit perturbations, inclined orbits, calendars, universal time, sidereal time, orbital plane, local mean time and sun synchronous orbits, Geostationary orbit: Introduction, antenna, look angles, polar mix antenna, limits of visibility, earth eclipse of satellite, sun transit outage, leandiag orbits. **7 Hours**

UNIT - 3

PROPAGATION IMPAIRMENTS AND SPACE LINK: Introduction, atmospheric loss, ionospheric effects, rain attenuation, other impairments.

SPACE LINK: Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, combined CNR.

7 Hours

UNIT - 4

SPACE SEGMENT: Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, transponders, antenna subsystem.

6 Hours

PART – B

UNIT - 5 & 6

EARTH SEGEMENT: Introduction, receive only home TV system, out door unit, indoor unit, MATV, CATV, Tx – Rx earth station. **5 Hours**

INTERFERENCE AND SATELLITE ACCESS: Introduction, interference between satellite circuits, satellite access, single access, pre-assigned FDMA, SCPC (spade system), TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, comparison of uplink power requirements for TDMA & FDMA, on board signal processing satellite switched TDMA. **9 Hours**

UNIT - 7 & 8

DBS, SATELLITE MOBILE AND SPECIALIZED SERVICES: Introduction, orbital spacing, power ratio, frequency and polarization, transponder capacity, bit rates for digital TV, satellite mobile services, USAT, RadarSat, GPS, orb communication and Indian Satellite systems.

12 Hours

TEXT BOOK:

1. **Satellite Communications**, Dennis Roddy, 4th Edition, McGraw-Hill International edition, 2006.

REFERENCES BOOKS:

1. **Satellite Communications**, Timothy Pratt, Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley Pvt. Ltd & Sons, 2008.
2. **Satellite Communication Systems Engineering**, W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.

RANDOM PROCESSES

Subject Code	: **10EC663**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO PROBABILITY THEORY: Experiments, sample space, Events, Axioms, Assigning probabilities, Joint and conditional probabilities, Baye’s Theorem, Independence, Discrete Random Variables, Engg Example. **7 Hours**

UNIT - 2

Random Variables, Distributions, Density Functions: CDF, PDF, Gaussian random variable, Uniform Exponential, Laplace, Gamma, Erlang, Chi-Square, Raleigh, Rician and Cauchy types of random variables.

6 Hours

UNIT - 3

OPERATIONS ON A SINGLE R V: Expected value, EV of Random variables, EV of functions of Random variables, Central Moments, Conditional expected values. **7 Hours**

UNIT - 4

Characteristic functions, Probability generating functions, Moment generating functions, Engg applications, Scalar quantization, entropy and source coding.

6 Hours

PART – B

UNIT - 5

Pairs of Random variables, Joint CDF, joint PDF, Joint probability mass functions, Conditional Distribution, density and mass functions, EV involving pairs of Random variables, Independent Random variables, Complex Random variables, Engg Application. **7 Hours**

UNIT - 6

MULTIPLE RANDOM VARIABLES: Joint and conditional PMF, CDF, PDF,.EV involving multiple Random variables, Gaussian Random variable in multiple dimension, Engg application, linear prediction. **6 Hours**

UNIT - 7

RANDOM PROCESS: Definition and characterization, Mathematical tools for studying Random Processes, Stationary and Ergodic Random processes, Properties of ACF. **6 Hours**

UNIT - 8

EXAMPLE PROCESSES: Markov processes, Gaussian Processes, Poisson Processes, Engg application, Computer networks, Telephone networks.

7 Hours

TEXT BOOK:

1. **Probability and random processes: application to Signal processing and communication** - S L Miller and D C Childers**:** Academic Press / Elsivier 2004

REFERENCE BOOKS:

1. **Probability, Random variables and stochastic processes** - A. Papoullis and S U Pillai: McGraw Hill 2002.
2. **Probability, Random variables and Random signal principles** - Peyton Z Peebles**:** TMH 4th Edition 2007.
3. **Probability, random processes and applications** - H Stark and Woods**:** PHI 2001.

LOW POWER VLSI DESIGN

Subject Code	: **10EC664**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1

Introduction, Sources of power dissipation, designing for low power. Physics of power dissipation in MOSFET devices – MIS Structure, Long channel and sub-micron MOSFET, Gate induced Drain leakage. **6 Hours**

UNIT - 2

Power dissipation in CMOS – Short circuit dissipation, dynamic dissipation, Load capacitance. Low power design limits - Principles of low power design, Hierarchy of limits, fundamental limits, Material, device, circuit and system limits. **8 Hours**

UNIT – 3&4

SYNTHESIS FOR LOW POWER: Behavioral, Logic and Circuit level approaches, Algorithm level transforms, Power-constrained Least squares optimization for adaptive and non-adaptive filters, Circuit activity driven architectural transformations, voltage scaling, operation reduction and substitution, pre- computation, FSM and Combinational logic, Transistor sizing. **12 Hours**

PART – B

UNIT – 5&6

DESIGN AND TEST OF LOW-VOLTAGE CMOS CIRCUITS: Introduction, Design style, Leakage current in Deep sub-micron transistors, device design issues, minimizing short channel effect, Low voltage design techniques using reverse V_{gs}, steep sub threshold swing and multiple threshold voltages, Testing with elevated intrinsic leakage, multiple supply voltages. **12 Hours**

UNIT - 7

LOW ENERGY COMPUTING: Energy dissipation in transistor channel, Energy recovery circuit design, designs with reversible and partially reversible logic, energy recovery in adiabatic logic and SRAM core, Design of peripheral circuits – address decoder, level shifter and I/O Buffer, supply clock generation. **7 Hours**

UNIT - 8

SOFTWARE DESIGN FOR LOW POWER: Introduction, sources of power dissipation, power estimation and optimization. **7 Hours**

TEXT BOOK:

1. **Low-Power CMOS VLSI Circuit Design**, Kaushik Roy and Sharat C Prasad, John Wiley Pvt. Ltd, 2008.

DATA STRUCTURE USING C++

Subject Code	: **10EC665**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION: Functions and parameters, Dynamic memory allocation classis, Testing and debugging. Data Representation, Introduction, Linear lists, Formula-based representation linked representation, Indirect addressing simulating pointers. **7 Hours**

UNIT - 2
ARRAYS AND MATRICS: Arrays, Matrices, Special matrices spare matrices. **6 Hours**

UNIT - 3
STACKS: The abstract data types, Derived classed and inheritance, Formula-based representation, Linked representation, Applications. **7 Hours**

UNIT - 4
Queues: The abstract data types, Derived classes and inheritance, Formula-based representation, Linked Linked representation, Applications. **6 Hours**

PART – B

UNIT - 5
SKIP LISTS AND HASHING: Dictionaries, Linear representation, Skip list presentation, Hash table representation. **6 Hours**

UNIT - 6
BINARY AND OTHER TREES: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT and class extensions. **8 Hours**

UNIT - 7
PRIRITY QUEUES: Linear lists, Heaps, Leftist trees. **6 Hours**

UNIT-8
Search Trees: Binary search trees, B-trees, Applications. **6 Hours**

TEXT BOOK:

1. **Data structures, Algorithms, and applications in C++ -** Sartaj Sahni, McGraw Hill.2000.
2.

REFERENCE BOOKS:

1. **Object Oriented Programming in C++** - Balaguruswamy. TMH, 1995.
2. **Programming in C++** - Balaguruswamy. TMH, 4th, 2010 .

DIGITAL SYSTEMS DESIGN USING VERILOG

Subject Code	: **10EC666**	IA Marks	: 25
No. of Lecture Hours /week	: 04	Exam Hours	: 03
Total no. of Lecture Hours	: 52	Exam Marks	: 100

PART – A

UNIT 1
Introduction and Methodology:
Digital Systems and Embedded Systems, Binary representation and Circuit Elements, Real-World Circuits, Models, Design Methodology.
7 Hours

UNIT 2
Combinational Basics:
Boolean Functions and Boolean Algebra, Binary Coding, Combinational Components and Circuits, Verification of Combinational Circuits.
7 Hours

UNIT 3
Number Basics:
Unsigned and Signed Integers, Fixed and Floating-point Numbers.
6 Hours

UNIT 4
Sequential Basics: Storage elements, Counters, Sequential Datapaths and Control, Clocked Synchronous Timing Methodology. **6 Hours**

PART – B

UNIT 5
Memories: Concepts, Memory Types, Error Detection and Correction.
Implementation Fabrics: ICs, PLDs, Packaging and Circuit Boards, Interconnection and Signal Integrity. **7 Hours**

UNIT 6
Processor Basics: Embedded Computer Organization, Instruction and Data, Interfacing with memory. **6 Hours**

UNIT 7
I/O interfacing: I/O devices, I/O controllers, Parallel Buses, Serial Transmission, I/O software. **6 Hours**

UNIT 8
Accelerators: Concepts, case study, Verification of accelerators.

Design Methodology: Design flow, Design optimization, Design for test,

7 Hours

TEXT BOOK:

1. **"Digital Design: An Embedded Ssytems Approach Using VERILOG", Peter J. Ashenden, Elesvier, 2010.**

VIRTUAL INSTRUMENTATION

Subject Code	: **10EC667**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1
Review of Digital Instrumentation: Representation of analog signals in the digital domain – Review of quantization in amplifier and time areas, sample and hold, sampling theorem, ADC and DAC.

8 Hours

UNIT 2 & 3
Fundamentals of Virtual Instrumentation: Concept of Virtual Instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency – Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi channel analog inputs. Concept of universal DAQ card – Use of timer-counter and analog outputs on the universal DAQ card.

12 Hours

UNIT 4
Cluster of Instruments in System: Interfacing of external instruments to a PC – RS 232C, RS – 422, RS 485 and USB standards – IEEE 488 standard – ISO –OSI model for series bus – introduction to bus protocols of MOD bus and CAN bus.

8 Hours

PART – B

UNIT 5 & 6

Graphical Programming Environment in VI: Concepts of graphical programming – Lab-view software – Concept of VIs and sub VIs – Display types – Digital – Analog – Chart – Oscilloscope types – Loops – Case and sequence structures – Types of data – Arrays – Formulate nodes – Local and Global variables – String and file I/O.

12 Hours

UNIT 7 & 8

Analysis Tools and Simple Application in VI: Fourier transform – Power spectrum – Correlation – Windowing and filtering tools – Simple temperature indicator – ON/OFF controller – PID controller – CRO emulation – Simulation of a simple second order system – Generation of HTML page.

12 Hours

TEXT BOOKS:

1. Sanjay Gupta, "**Virtual Instrumentation, LABVIEW"**, TMH, New Delhi, 2003.
2. S. Gupta and J P Gupta,"**PC Interfacing for Data Acquisition and Process Control"**, Instrument Society of America, 1994.

REFERENCE BOOKS:

1. Peter W Gofton , "Understanding Serial Communication", Sybes International, 2000.
2. Robert H. Bishop, "Learning with Lab-View" Preticee Hall, 2009.
3. Ernest O. Doeblin and Dhanesh N Manik, " Measrement Systems – Application and Design", 5th Edn, TMH, 2007.

VII SEMESTER

COMPUTER COMMUNICATION NETWORKS

Subject Code	: **10EC71**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Layered tasks, OSI Model, Layers in OSI model, TCP?IP Suite, Addressing, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission. **7 Hours**

UNIT - 2

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC. **6 Hours**

UNIT - 3

MULTIPLE ACCESSES: Random access, Controlled access, Channelisation. **6 Hours**

UNIT - 4

Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

7 Hours

PART – B

UNIT - 5

Connecting LANs, Backbone and Virtual LANs, Connecting devices, Back bone Networks, Virtual LANs **7 Hours**

UNIT - 6

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6. **6 Hours**

UNIT - 7

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols. **6 Hours**

UNIT - 8
Transport layer Process to process Delivery, UDP, TCP, Domain name system, Resolution. **7 Hours**

TEXT BOOK:
1. **Data Communication and Networking**, B Forouzan**,** 4th Ed, TMH 2006.

REFERENCE BOOKS:
1. **Computer Networks**, James F. Kurose, Keith W. Ross: Pearson education, 2nd Edition, 2003.
2. **Introduction to Data communication and Networking**, Wayne Tomasi: Pearson education 2007.

OPTICAL FIBER COMMUNICATION

Subject Code	: **10EC72**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
OVERVIEW OF OPTICAL FIBER COMMUNICATION: Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber (no derivations in article 2.4.4), single mode fiber, cutoff wave length, mode filed diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers. **7 Hours**

UNIT - 2
TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, **A**ttenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion. **6 Hours**

UNIT - 3
OPTICAL SOURCES AND DETECTORS: Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors. **6 Hours**

UNIT - 4
FIBER COUPLERS AND CONNECTORS: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. **6 Hours**

PART – B

UNIT - 5
OPTICAL RECEIVER: Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver, operation, Analog receivers. **6 Hours**

UNIT - 6
ANALOG AND DIGITAL LINKS: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.
Digital links – Introduction, point–to–point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.
8 Hours

UNIT - 7
WDM CONCEPTS AND COMPONENTS: WDM concepts, overview of WDM operation principles, WDM standards, Mach-Zehender interferometer, multiplexer, Isolators and circulators, direct thin film filters, active optical components, MEMS technology, variable optical attenuators, tunable optical fibers, dynamic gain equalizers, optical drop multiplexers, polarization controllers, chromatic dispersion compensators, tunable light sources.
7 Hours

UNIT - 8
Optical Amplifiers and Networks – optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA.
OPTICAL NETWORKS: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides. **6 Hours**

TEXT BOOKS:

1. **"Optical Fiber Communication"**, Gerd Keiser, 4th Ed., MGH, 2008.
2. **"Optical Fiber Communications"**, John M. Senior, Pearson Education. 3rd Impression, 2007.

REFERENCE BOOK:

1. **Fiber Optic Communication** - Joseph C Palais: 4th Edition, Pearson Education.

POWER ELECTRONICS

Subject Code	: **10EC73**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects. **6 Hours**

UNIT - 2

POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base derive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.

6 Hours

UNIT - 3

INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.

7 Hours

UNIT - 4

CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1φ fully controlled converters, Duel converters, 1 φ semi converters (all converters with R & RL load).

7 Hours

PART – B

UNIT - 5

Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems. **7 Hours**

UNIT - 6

AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with restive loads and Inductive loads, numerical problems.

6 Hours

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators. **6 Hours**

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1φ bridge inverter, voltage control of 1φ invertors, current source invertors, Variable DC link inverter.

7 Hours

TEXT BOOKS:

1. **"Power Electronics" -** M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **"Power Electronics" -** M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **"Power Electronics, Essentials and Applications", L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **"Power Electronics"** , Daniel W. Hart, McGraw Hill, 2010.
3. **"Power Electronics**", V Nattarasu and R.S. Anandamurhty, **Pearson/Sanguine Pub. 2006.**

EMBEDED SYSTEM DESIGN

Subject Code	: **10EC74**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **5 Hours**

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A

First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
The concepts of State and Time, The State Diagram, Finite State Machines-A Theoretical Model.

8 Hours

UNIT 3:
Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

7 Hours

UNIT 4:
Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **6 Hours**

PART – B

UNIT 5 & 6:
Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited.

12 Hours

UNIT 7 & 8:
Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance.

12 Hours

TEXT BOOK:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol**,** John Weily India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Embedded Systems: Architecture and Programming,** Raj Kamal, TMH. 2008.
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005.
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008.

VLSI LAB

Subject Code	: **10ECL77**	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

(Wherever necessary Cadence/Synopsis/Menta Graphics tools <u>must be</u> used)

PART - A
DIGITAL DESIGN

ASIC-DIGITAL DESIGN FLOW

1. Write Verilog Code for the following circuits and their Test Bench for **verification**, observe the waveform and **synthesize** the code with technological library with given Constraints*. Do the initial timing verification with gate level simulation.

1. An inverter
2. A Buffer
3. Transmission Gate
4. Basic/universal gates
5. Flip flop -RS, D, JK, MS, T
6. Serial & Parallel adder
7. 4-bit counter [Synchronous and Asynchronous counter]
8. Successive approximation register [SAR]

** An appropriate constraint should be given*

PART - B
ANALOG DESIGN

Analog Design Flow

1. Design an **Inverter** with given specifications*, completing the design flow mentioned below:
   a. **Draw the schematic** and verify the following
      i) DC Analysis
      ii) Transient Analysis
   b. **Draw the Layout** and verify the DRC, ERC
   c. Check for LVS
   d. Extract RC and back annotate the same and verify the Design
   e. Verify & Optimize for Time, Power and Area to the given constraint***

2. Design the following circuits with given specifications*, completing the design flow mentioned below:
   a. Draw the schematic and verify the following
      i) DC Analysis
      ii) AC Analysis
      iii) Transient Analysis
   b. Draw the Layout and verify the DRC, ERC
   c. Check for LVS
   d. Extract RC and back annotate the same and verify the Design.
      i) A Single Stage differential amplifier
      ii) Common source and Common Drain amplifier

3. Design an **op-amp** with given specification* using given differential amplifier Common source and Common Drain amplifier in library** and completing the design flow mentioned below:
   a. Draw the schematic and verify the following
      i) DC Analysis
      ii). AC Analysis
      iii) Transient Analysis
   b. Draw the Layout and verify the DRC, ERC
   c. Check for LVS
   d. Extract RC and back annotate the same and verify the Design.

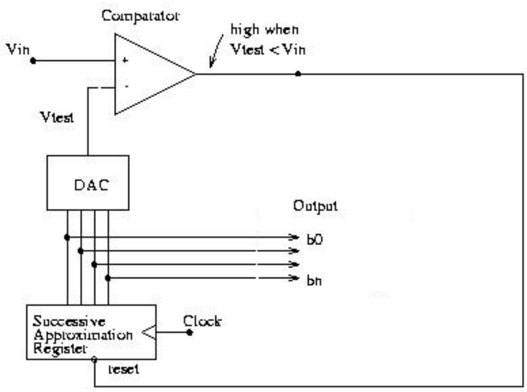
4. Design a **4 bit R-2R based DAC** for the given specification and completing the design flow mentioned using given op-amp in the library**.
   a. Draw the schematic and verify the following

i) DC Analysis
ii) AC Analysis
iii) Transient Analysis

b. Draw the Layout and verify the DRC, ERC
c. Check for LVS
d. Extract RC and back annotate the same and verify the Design.

5. For the **SAR based ADC** mentioned in the figure below draw the mixed signal schematic and verify the functionality by completing ASIC Design FLOW.

[Specifications to GDS-II]



* Appropriate specification should be given.
** Applicable Library should be added & information should be given to the Designer.
*** An appropriate constraint should be given

POWER ELECTRONICS LAB

Subject Code	: **10ECL78**	IA Marks	: 25
No. of Practical Hrs/Week: 03		Exam Hours	: 03
Total no. of Practical Hrs. : 42		Exam Marks	: 50

Any five converter circuits experiment from the below list **must be** simulated using the **spice-simulator**.

- Static characteristics of SCR and DIAC.
- Static characteristics of MOSFET and IGBT.

- Controlled HWR and FWR using RC triggering circuit
- SCR turn off using i) LC circuit ii) Auxiliary Commutation
- UJT firing circuit for HWR and FWR circuits.
- Generation of firing signals for thyristors/ trials using digital circuits / microprocessor.
- AC voltage controller using triac – diac combination.
- Single phase Fully Controlled Bridge Converter with R and R-L loads.
- Voltage (Impulse) commutated chopper both constant frequency and variable frequency operations.
- Speed control of a separately exited DC motor.
- Speed control of universal motor.
- Speed control of stepper motor.
- Parallel / series inverter.

Note: Experiments to be conducted with isolation transformer and low voltage.

DSP ALGORITHMS AND ARCHITECTURE

Subject Code	: **10EC751**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO DIGITAL SIGNAL PROCESSING: Introduction, A Digital Signal-Processing System, The Sampling Process, Discrete Time Sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time-Invariant Systems, Digital Filters, Decimation and Interpolation. **6 Hours**

UNIT - 2

ARCHITECTURES FOR PROGRAMMABLE DIGITAL SIGNAL-PROCESSORS: Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing. **7 Hours**

UNIT - 3

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of

TMS32OC54xx., Memory Space of TMS32OC54xx Processors, Program Control. **6 Hours**

UNIT - 4

Detail Study of TMS320C54X & 54xx Instructions and Programming, On-Chip peripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xx Processor. **7 Hours**

PART – B

UNIT - 5

IMPLEMENTATION OF BASIC DSP ALGORITHMS: Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case). **7 Hours**

UNIT - 6

IMPLEMENTATION OF FFT ALGORITHMS: Introduction, An FFT Algorithm for DFT Computation, Overflow and Scaling, Bit-Reversed Index Generation & Implementation on the TMS32OC54xx. **6 Hours**

UNIT - 7

INTERFACING MEMORY AND PARALLEL I/O PERIPHERALS TO DSP DEVICES: Introduction, Memory Space Organization, External Bus Interfacing Signals. Memory Interface, Parallel I/O Interface, Programmed I/O, Interrupts and I / O Direct Memory Access (DMA). **6 Hours**

UNIT - 8

INTERFACING AND APPLICATIONS OF DSP PROCESSOR: Introduction, Synchronous Serial Interface, A CODEC Interface Circuit. DSP Based Bio-telemetry Receiver, A Speech Processing System, An Image Processing System. **7 Hours**

TEXT BOOK:

1. **"Digital Signal Processing"**, Avatar Singh and S. Srinivasan, Thomson Learning, 2004.

REFERENCE BOOKS:

1. **Digital Signal Processing: A practical approach**, Ifeachor E. C., Jervis B. W Pearson-Education, PHI/ 2002
2. **"Digital Signal Processors"**, B Venkataramani and M Bhaskar TMH, 2nd, 2010
3. **"Architectures for Digital Signal Processing"**, Peter Pirsch John Weily, 2008

MICRO AND SMART SYSTEMS TECHNOLOGY

Subject Code	:	**10MS752**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT - 1

INTRODUCTION TO MICRO AND SMART SYSTEMS:

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products. **6 Hours**

UNIT - 2

MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS:

a) Definitions and salient features of sensors, actuators, and systems.

b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator.

d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin. **7 Hours**

UNIT - 3

MICROMANUFACTURING AND MATERIAL PROCESSING:

a. Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.
b. Silicon micromachining: surface, bulk, moulding, bonding based process flows.
c. Thick-film processing:
d. Smart material processing:
e. Processing of other materials: ceramics, polymers and metals
f. Emerging trends. **7 Hours**

UNIT - 4
MODELING:

a. Scaling issues.
b. Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.
c. Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators. **6 Hours**

PART – B

UNIT - 5
COMPUTER-AIDED SIMULATION AND DESIGN:
Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software. **6 Hours**

UNIT - 6
ELECTRONICS, CIRCUITS AND CONTROL:
Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.
7 Hours

UNIT - 7
INTEGRATION AND PACKAGING OF MICROELECTRO MECHANICAL SYSTEMS:
Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples. **7 Hours**

UNIT - 8
CASE STUDIES:
BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam. **6 Hours**

UNIT - 9
Mini-projects and class-demonstrations (<u>not for Examination</u>)

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)
b) BEL pressure sensor
c) Thermal-cycler for PCR
d) Active control of a cantilever beam

TEXT BOOKS AND A CD-SUPPLEMENT:

1. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Tsu, Tata Mc-Graw-Hill.
2. **"Micro and Smart Systems"** by Dr. A.K.Aatre, Prof. Ananth Suresh, Prof.K.J.Vinoy, Prof. S. Gopalakrishna,, Prof. K.N.Bhat.,John Wiley Publications.

REFERENCE BOOKS:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.
3. **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.
4. **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.
5. **Design and Development Methodologies,** Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.
6. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007

ARTIFICIAL NEURAL NETWORKS

Subject Code	: **10EC753**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks. **6 Hours**

UNIT - 2
Supervised learning, single layer networks, perceptions, linear separability, perceptions training algorithm, guarantees of success, modifications.
7 Hours

UNIT - 3
Multiclass networks-I, multilevel discrimination, preliminaries, back propagation, setting parameter values, theoretical results. **7 Hours**

UNIT - 4
Accelerating learning process, application, mandaline, adaptive multilayer networks. **6 Hours**

PART – B

UNIT - 5
Prediction networks, radial basis functions, polynomial networks, regularization, unsupervised learning, winner take all networks. **6 Hours**

UNIT - 6
Learning vector quantizing, counter propagation networks, adaptive resonance theorem, toplogically organized networks, distance based learning, neo-cognition. **7 Hours**

UNIT - 7
Associative models, hop field networks, brain state networks, Boltzmann machines, hetero associations. **6 Hours**

UNIT - 8
Optimization using hop filed networks, simulated annealing, random search, evolutionary computation. **7 Hours**

TEXT BOOK:

1. **Elements of Artificial Neural Networks**, Kishan Mehrotra, C. K. Mohan, Sanjay Ranka, Penram, 1997.

REFERENCE BOOKS:

1. **Artificial Neural Networks**, R. Schalkoff, MGH, 1997.
2. **Introduction to Artificial Neural Systems**, J. Zurada, Jaico, 2003.
3. **Neural Networks,** Haykins, Pearson Edu., 1999.

CAD FOR VLSI

Subject Code	: **10EC754**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1&2
INTRODUCTION TO VLSI METHODOLOGIES: VLSI Physical Design Automation - Design and Fabrication of VLSI Devices - Fabrication process and its impact on Physical Design. **12 Hours**

UNIT – 3&4
A QUICK TOUR OF VLSI DESIGN AUTOMATION TOOLS: Data structures and Basic Algorithms, Algorithmic Graph theory and computational complexity, Tractable and Intractable problems. **14 Hours**

PART – B

UNIT – 5&6
GENERAL PURPOSE METHODS FOR COMBINATIONAL OPTIMIZATION: partitioning, floor planning and pin assignment, placement, routing. **14 Hours**

UNIT – 7&8
SIMULATION-LOGIC SYNTHESIS: Verification-High level synthesis - Compaction. Physical Design Automation of FPGAs, MCMS-VHDL-Verilog-Implementation of Simple circuits using VHDL and Verilog.
12 Hours

REFERENCE BOOKS:

1. **"Algorithms for VLSI Physical Design Automation"**, N. A. Shervani, 1999.
2. **"Algorithms for VLSI Design Automation"**, S. H. Gerez, 1998.
3. **Embedded Systems : Architecture, Programming, and Design,** Raj Kamal, 2^{nd} Edn. TMH, 2008.

REFERENCE BOOKS:

1. **Embedded System Design – A certified Hardware / Software Introduction,** Frank Vahid, John Wikey & Sons, 2002.
2. **An embedded Software Primer** by David E Simon, Pearson Edition 1999.

APPLIED EMBEDDED SYSTEM DESIGN

Subject Code	: **10EC755**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO THE EMBEDDED SYSTEMS: An embedded System, Processor embedded into a system (A). Embedded Hardware Units and devices in a system, Embedded software in a system, Examples of embedded systems, Embedded system-on-chip (SoC) and use of VLSI circuits design technology (A), Complex systems design and processors, Design process in embedded system, Formalism of system design, Design process and design examples, Classification of embedded systems, Skills required for an embedded system designer.

5 Hours

UNIT - 2

8051 AND ADVANCED PROCESSOR ARCHITECTURE: 8051 Architecture, Real world interfacing, Introduction to advanced architecture Processor and memory architecture, Instruction level parallelism, Performance metrics Memory types and addresses, Processor selection, Memory selection.

5 Hours

UNIT - 3

DEVICES AND COMMUNICATION BUSES FOR DEVICES NETWORK: Devices and Communication buses for Networks, Serial communication devices Parallel port devices, Sophisticated interfacing features in device ports, Wireless communication devices, Timer and counting devices, Watchdog timers, Real time clocks Parallel bus device protocols – parallel communication network using the ISA, PCI, PCI-X and advanced buses, Wireless and mobile system protocols..

6 Hours

UNIT - 4

DEVICE DRIVERS AND INTERRUPTS SERVICING MECHANISM: Port or device access without interrupt servicing mechanism, Interrupt service routine, thread and device driver concept, Interrupt sources, Interrupt servicing (handling) mechanism Multiple interrupts, Context and the periods for context-switching, interrupt latency and Deadline Classification of processors interrupt service mechanism from context saving angle Direct memory access, Device driver programming, Parallel port device drivers in a system Serial port device drivers in a system, Timer devices and devices interrupts.

8 Hours

PART – B

UNIT - 5

PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++ AND JAVA: Software programming in assembly language (ALP) and in high level language ‘C’, ‘C’ programming elements: header and source files and preprocessor directives, program elements : macros and functions, Program elements : data types, data structures, modifiers, statements, loops and pointers, Objected oriented programming, Embedded programming in Java, Optimisation of Memory needs.

5 Hours

UNIT - 6

PROGRAM MODELING CONCEPTS IN SINGLE AND MULTIPROCESSOR SYSTEMS SOFTWARE – DEVELOPMENT PROCESS: Program models, Data flow graph models, State machine programming models for event controlled programs, Modeling of multiprocessor systems, UML modeling.

5 Hours

UNIT - 7

REAL TIME OPERATING SYSTEMS – 1: INTER PROCESS COMMUNICATION AND SYNCHRONISATION OF PROCESSES, TASK AND THREADS: Multiple processes in an application, Multiple threads in an applications, Task Tasks and states, Tasks and data, Clear cut distinction between Functions, ISRs and Tasks by their Characteristics, Concept of semaphores, Shared data, Inter process communications Signals, Semaphores, Message queues, Mailboxes, Pipes, Sockets, Remote procedure calls (RPCs)..

8 Hours

UNIT - 8

REAL TIME OPERATING SYSTEMS: Operating system service, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management Interrupt routines in RTOS environment and handling of interrupt source calls by RTOS Introduction to Real time Operating System, Basic design using a Real Time Operating System, RTOS Task Scheduling Models, Latency, Response Times, Deadline as Performance Metric, OS security issues, IEEE Standard POSIX 1003.1 b Functions for Standardisation of RTOS an Inter Process Communication Functions, Types of Real Time Operating Systems RTOSμC/OS-II, RTOS Vx Works.

10 Hours

TEXT BOOK:

1. **Embedded System Architecture & Programming** by Raj Kamal, TMH, 2008 (latest edition).
2. **An embedded Software Primer** by David E Simon, Pearson Edition 1999.

REFERENCE BOOKS:

1. **Introduction to Embedded System Design – A certified Hardware / Software** by Bank Vahid, John Wikey & Sons, 2002.
2. **An embedded Software Primer** by David E Simon, Pearson Edition 1999.

Lab Work: (Part of the theory class)

1. Write C prog to initialize the I/O ports and interface the following:
   a. LED / LCD Display
   b. Stepper Motor
   c. Elevator

DIGITAL CMOS CIRCUITS: Overview, Design and performance analysis of CMSO inverter, Logic Gate Circuits, Pass-transistor logic, Dynamic Logic Circuits, SPICE examples.

TEXT BOOK:

1. **Microelectronic Circuits,** Adel Sedra and K.C. Smith, 5th Edition, Oxford University Press, International Veersion, 2009.

REFERENCE BOOKS:

1. **Fundamentals of Microelectronics,** Behzad Razavi, John Wiley India Pvt. Ltd., 2008.
2. **Microelectronics – Analysis and Design,** Sundaram Natarajan, Tata McGraw-Hill, 2007.

SPEECH PROCESSING

Subject Code	: **10EC756**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
PRODUCTION AND CLASSIFICATION OF SPEECH SOUNDS: Introduction, mechanism of speech production. Acoustic phonetics: vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates. **6 Hours**

UNIT - 2
TIME-DOMAIN METHODS FOR SPEECH PROCESSING: time dependent processing of speech, short-time energy and average magnitude, short-time average zero crossing rate. **6 Hours**

UNIT - 3
Speech vs. silence detection, pitch period estimation using parallel processing approach, short-time autocorrelation function. **7 Hours**

UNIT - 4
Brief Applications of temporal processing of speech signals in synthesis, enhancement, hearing applications and clear speech. **7 Hours**

PART – B

UNIT - 5
FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING: Introduction, definitions and properties: Fourier transforms interpretation and linear filter interpretation, sampling rates in time and frequency.
7 Hours

UNIT - 6
Filter bank summation and overlap add methods for short-time synthesis of speech, sinusoidal and harmonic plus noise method of analysis/synthesis.
6 Hours

UNIT - 7

HOMOMORPHIC SPEECH PROCESSING: Introduction, homomorphic system for convolution, the complex cepstrum of speech, homomorphic vocoder.

6 Hours

UNIT - 8

APPLICATIONS OF SPEECH PROCESSING: Brief applications of speech processing in voice response systems hearing aid design and recognition systems. **7 Hours**

TEXT BOOK:

1. **Digital Processing of Speech Signals**, L. R. Rabiner and R. W. Schafer, Pearson Education Asia, 2004.

REFERENCE BOOKS:

1. **Discrete Time Speech Signal Processing**, T. F. Quatieri, Pearson Education Asia, 2004.
2. **Speech and Audio Signal Processing: Processing and Perception of Speech and Music**, B. Gold and N. Morgan, John Wiley India Pvt. Ltd, 2004.

ELECTIVE-III (GROUP-C)
PROGRAMMING IN C++

Subject Code	: **10EC761**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

C++, AN OVERVIEW: Getting started, the C++ program, Preprocessor Directives, The Built-In Array Data Type, Dynamic Memory Allocation and Pointers, An Object – based Design, An Object-Oriented Design, An Exception – based Design, An array. **7 Hours**

UNIT - 2

THE BASIC LANGUAGE: Literal Constant, Variables, Pointer Type, String Types, const Qualifier, Reference Types, the bool type, Enumeration types, Array types. The vector container type. **6 Hours**

UNIT - 3

OPERATORS: Arithmetic Operators, Equality, Relational and Logical operators, Assignment operators, Increment and Decrement operator, The conditional Operator, Bitwise operator, bitset operations. Statements: if, switch, for Loop, while, break, goto, continue statements.

7 Hours

UNIT - 4

FUNCTIONS: Prototype, Argument passing, Recursion and linear function.

6 Hours

PART – B

UNIT - 5

EXCEPTION HANDLING: Throwing an Exception, Catching an exception, Exception Specification and Exceptions and Design Issues.

7 Hours

UNIT - 6

CLASSES: Definition, Class Objects, Class Initailization, Class constructior, The class destructor, Class Object Arrays and Vectors. **7 Hours**

UNIT - 7

Overload Operators, Operators ++ and --, Operators new and delete.

6 Hours

UNIT - 8

Multiple Inheritances**,** public, private & protected inheritance, Class scope under Inheritance. **6 Hours**

TEXT BOOK:

1. **C++ Primer**, S. B. Lippman & J. Lajoie, 3rd Edition, Addison Wesley, 2000.

REFERENCE BOOKS:

1. **C++ Program Design: An Introduction to Programming and Object- Oriented Design**. Cohoon and Davidson, 3rd Edn. TMH publication. 2004.
2. **Object Oriented Programming using C++**, R. Lafore, Galgotia Publications, 2004.

REAL-TIME SYSTEMS

Subject Code	: **10EC762**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO REAL-TIME SYSTEMS: Historical background, RTS Definition, Classification of Real-time Systems, Time constraints, Classification of Programs. **6 Hours**

UNIT - 2

CONCEPTS OF COMPUTER CONTROL: Introduction, Sequence Control, Loop control, Supervisory control, Centralised computer control, Distributed system, Human-computer interface, Benefits of computer control systems.

6 Hours

UNIT - 3

COMPUTER HARDWARE REQUIREMENTS FOR RTS: Introduction, General purpose computer, Single chip microcontroller, Specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface. **7 Hours**

UNIT - 4

LANGUAGES FOR REAL-TIME APPLICATIONS: Introduction, Syntax layout and readability, Declaration and Initialization of Variables and Constants, Modularity and Variables, Compilation, Data types, Control Structure, Exception Handling, Low-level facilities, Co routines, Interrupts and Device handling, Concurrency, Real-time support, Overview of real-time languages. **7 Hours**

PART – B

UNIT - 5 & 6

OPERATING SYSTEMS: Introduction, Real-time multi-tasking OS, Scheduling strategies, Priority Structures, Task management, Scheduler and real-time clock interrupt handles, Memory Management, Code sharing, Resource control, Task co-operation and communication, Mutual exclusion, Data transfer, Liveness, Minimum OS kernel, Examples. **14 Hours**

UNIT - 7

DESIGN OF RTSS – GENERAL INTRODUCTION: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors. **6 Hours**

UNIT - 8

RTS DEVELOPMENT METHODOLOGIES: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method. **6 Hours**

TEXT BOOKS:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

REFERENCE BOOKS:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

IMAGE PROCESSING

Subject Code	: **10EC763**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception. **6 Hours**

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

6 Hours

UNIT - 3

IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **7 Hours**

UNIT - 4

Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **7 Hours**

PART – B

UNIT - 5

IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Trans -formations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. **7 Hours**

UNIT - 6

Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering. **6 Hours**

UNIT - 7

Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering,

7 Hours

UNIT - 8

Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

6 Hours

TEXT BOOK:

1. **"Digital Image Processing"**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:

1. **"Fundamentals of Digital Image Processing"**, Anil K. Jain, Pearson Education, 2001.
2. **"Digital Image Processing and Analysis"**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

RADIO FREQUENCY INTEGRATED CIRCUITS

Subject Code	: **10EC764**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

OVERVIEW OF WIRELESS PRINCIPLES: A brief history of wireless systems, Noncellular wireless applications, Shannon, Modulations & Alphabet Soup, Propagation. **3 Hours**

PASSIVE RLC NETWORKS: Introduction, Parallel RLC Tank, Series RLC Networks, Other RLC networks, RLC Networks as impedance Transformers. **4 Hours**

UNIT - 2

CHARACTERISTICS OF PASSIVE IC COMPONENTS: Introduction, Interconnect at radio frequencies: Skin effect, resisters, Capacitors, Inductors, Transformers, Interconnect options at high frequency. **6 Hours**

UNIT - 3

A REVIEW OF MOS DEVICE PHYSICS: Introduction, A little history, FETs, MOSFET physics, The long – channels approximation, operation in weak inversion (sub threshold), MOS device physics in the short – channel regime, Other effects. **3 Hours**

DISTRIBUTED SYSTEMS: Introduction, Link between lumped and distributed regimes driving-point impedance of iterated structures, Transmission lines in more detail, Behavior of Finite – length transmission lines, summary of transmission line equations, artificial lines. **4 Hours**

UNIT - 4

THE SMITH CHART AND S-PARAMETERS: Introduction, The smith chart, S-parameters, Band Width Estimation Techniques, Introduction, The method of open – circuit time constant, The method of short circuit time constant, Risetime, Delay and bandwidth. **6 Hours**

PART – B

UNIT - 5

HIGH FREQUENCY AMPLIFIER DESIGN: Introduction, Zeros as bandwidth Enhancers, The shunt –series amplifier, Bandwidth Enhancement with f_T Doublers, Tuned amplifiers, Neutralization and unilateralization, Cascaded amplifiers, AM – PM conversion. **7 Hours**

UNIT - 6

VOLTAGE REFERENCES AND BIASING: Introduction, Review of diode behavior, Diodes and bipolar transistors in CMOS technology, Supply –independent bias circuits, Bandgap voltage reference, Constant g_m bias. **Noise**: Introduction, Thermal noise, Shot noise, Flicker noise, Popcorn noise, Classical two- port noise theory, Examples of noise calculations, A handy rule of thumb, Typical noise performance. **6 Hours**

UNIT - 7

LOW NOISE AMPLIFIER DESIGN: Introduction, Derivation of intrinsic MOSFET two-port noise parameters, LNA topologies: Power match versus noise match, Power-constrained noise optimization, Design examples, linearity and large signal performance, Spurious – free Dynamic range. **Mixers:** Introduction, Mixer fundamental, Nonlinear systems as linear mixers. **7 Hours**

UNIT - 8

Multiplier – based mixers, Sub sampling mixers, Diode ring mixers, RF power amplifiers, Introduction, general considerations, Class A, AB, B and C power amplifier, Class D amplifiers, Class E amplifiers Class F amplifiers, Modulation of power amplifiers, summary of PA characteristics, RF PA design examples, additional design considerations, Design summery.

7 Hours

TEXT BOOK:

1. **The design of CMOS radio-frequency integrated circuit**, Thomas H. Lee, 2nd edition Cambridge, 2004.

REFERENCE BOOK:

1. **Design of Analog CMOS integrated circuit**, Behzad Razavi, Tata Mc Graw Hill, 2005.

WEVELET TRANSFORMS

Subject Code	: **10EC765**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

CONTINUOUS WAVELET TRANSFORM: Introduction, C-T wavelets, Definition of CWT, The CWT as a correlation. Constant Q-Factor Filtering Interpolation and time frequency resolution, the CWT as an operator, inverse CWT. **6 Hours**

UNIT - 2

INTRODUCTION TO DISCRETE WAVELET TRANSFORM AND ORTHOGONAL WAVELET DECOMPOSITION: Introduction. Approximation of vectors in nested linear vector spaces, (i) example of approximating vectors in nested subspaces of a finite dimensional liner vector space, (ii) Example of approximating vectors in nested subspaces of an infinite dimensional linear vector space. Example MRA. (i) Bases for the approximations subspaces and Harr scaling function, (ii) Bases for detail subspaces and Haar wavelet. **7 Hours**

UNIT - 3

MRA, ORTHO NORMAL WAVELETS AND THEIR RELATIONSHIP TO FILTER BANKS: Introduction, Formal definition of an MRA. Construction of a general orthonormal MRA, (i) scaling function and subspaces, (ii) Implication of dilation equation and orthogonality, a wavelet basis for MRA. (i) Two scale relations for (t), (ii) Basis for the detail subspace (iii) Direct sum decomposition, Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction, the signal. **7 Hours**

UNIT - 4

EXAMPLES OF WAVELETS: Examples of orthogonal basis generating wavelets, (i) Daubechies D_4 scaling function and wavelet. (ii) band limited wavelets, Interpreting orthonormal MRAs for Discrete time MRA, (iii) Basis functions for DTWT. **6 Hours**

PART – B

UNIT - 5

ALTERNATIVE WAVELET REPRESENTATIONS: Introduction, Bi-orthogonal wavelet bases, Filtering relationship for bi-orthogonal filters, Examples of bi-orthogonal scaling functions and wavelets. 2-D wavelets.

6 Hours

UNIT - 6

Non - separable multidimensional wavelets, wavelet packets. Wavelets Transform and Data Compression: Introduction, transform coding, DTWT for image compression (i) Image compression using DTWT and run-length encoding. **7 Hours**

UNIT - 7

(i) Embedded tree image coding (ii) compression with JPEG audio compression (iii) Audio masking, (iv) Wavelet based audio coding.

6 Hours

UNIT - 8

CONSTRUCTION OF SIMPLE WAVELETS: Construction of simple wavelets like Harr and DB1. Other Applications of Wavelet Transforms: Introduction, wavelet de-noising, speckle removal, edge detection and object isolation, Image fusions, Object detection by wavelet transforms of projections. **7 Hours**

TEXT BOOK:

1. **Wavelet transforms- Introduction to theory and applications**, Raghuveer M.Rao and Ajit S. Bapardikar, Person Education, 2000.

REFERENCE BOOKS:

1. **Wavelet transforms,** Prasad and Iyengar, John Wiley India Pvt. Ltd, 2007.
2. **Wave-let and filter banks**, Gilbert Strang and Nguyen Wellesley Cambridge press, 1996.
3. **Insight into WAVELETS from theory to practice,** K.P. Soman and K.L. Ramchandran, Eastern Economy Edition, 2008.

MODELING AND SIMULATION OF DATA NETWORKS

Subject Code	: **10EC766**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1&2
DELAY MODELS IN DATA NETWORKS: Queuing Models, M/M/1, M/M/m, M/M/□, M/M/m/m and other Markov System, M/G/1 System, Networks of Transmission Lines, Time Reversibility, Networks of Queues.
12 Hours

UNIT – 3&4
MULTI-ACCESS COMMUNICATION: Slotted Multi-access and the Aloha System, Splitting Algorithms, Carrier Sensing, Multi-access Reservations, Packet Radio Networks. **12 Hours**

PART – B

UNIT – 5&6
ROUTING IN DATA NETWORKS: Introduction, Network Algorithms and Shortest Path Routing, Broadcasting Routing Information: Coping with Link Failures, Flow models, Optimal Routing, and Topological Design, Characterization of Optimal Routing, Feasible Direction Methods for Optimal Routing, Projection Methods for Optimum Routing, Routing in the Codex Network. **14 Hours**

UNIT – 7&8
FLOW CONTROL: Introduction, Window Flow Control, Rate Control Schemes, Overview of Flow Control in Practice, Rate Adjustment Algorithms. **14 Hours**

REFERENCE BOOKS:

1. **“Data Networks"** Dimitri Bertsekas and Robert Gallager, 2nd edition, Prentice Hall of India, 2003.
2. **“High-Speed Networks and Internets”** William Stallings, Pearson Education (Asia) Pte. Ltd, 2004.
3. **“High Performance Communication Networks”** J. Walrand and P. Varaya, 2nd edition, Harcourt India Pvt. Ltd. & Morgan Kaufman, 2000.

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: **10EC81**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hours**

UNIT - 2
Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hours**

UNIT - 3
Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hours**

UNIT - 4
GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers **6 Hours**

PART – B

UNIT - 5
GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hours**

UNIT - 6
CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hours**

UNIT - 7
Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation

techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 Hours**

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hours**

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, "**Wireles and Mobile Network concepts and protocols**", John Wiley India Pvt. Ltd, 1st edition, 2010.
5. "**Wireless Communication – Principles & Practice**" , T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: **10EC82**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

7 Hours

UNIT - 2

EVOLUTION OF SWITCHING SYSTEMS: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems. **6 Hours**

DIGITAL SWITCHING SYSTEMS: Fundamentals : Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing. **7 Hours**

UNIT - 3

TELECOMMUNICATIONS TRAFFIC: Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems. **6 Hours**

UNIT - 4

SWITCHING SYSTEMS: Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems. **6 Hours**

PART – B

UNIT - 5

TIME DIVISION SWITCHING: Introduction, space and time switching, Time switching networks, Synchronisation. **6 Hours**

UNIT - 6

SWITCHING SYSTEM SOFTWARE: Introduction, Scope, Basic software architecture, Operating systems, Database Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Digital switching system software classification, Call models, Connect sequence, Software linkages during call, Call features, Feature flow diagram, Feature interaction. **7 Hours**

UNIT - 7

MAINTENANCE OF DIGITAL SWITCHING SYSTEM: Introduction, Scope, Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability, Embedded patcher concept, Growth of digital switching system central office, Generic program upgrade, A methodology for proper maintenance of digital switching system, Effect of firmware deployment on digital switching system, Firmware-software coupling, Switching system maintainability metrics, Upgrade process success rate, Number of patches applied per year, Diagnostic resolution rate, Reported critical and major faults corrected, A strategy improving software quality, Program for software process improvement, Software processes improvement, Software processes, Metrics, Defect analysis, Defect analysis. **7 Hours**

UNIT - 8

A GENERIC DIGITAL SWITCHING SYSTEM MODEL: Introduction, Scope, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital system, Common characteristics of digital switching systems. Analysis report. Reliability analysis. **6 Hours**

TEXT BOOKS:

1. **Telecommunication and Switching, Traffic and Networks** - J E Flood**:** Pearson Education, 2002.
2. **Digital Switching Systems**, Syed R. Ali, TMH Ed 2002.

REFERENCE BOOK:

1. **Digital Telephony** - John C Bellamy: Wiley India India Pvt. Ltd, 3rd Ed, 2008.

ELECTIVE –IV (GROUP D)
DISTRIBUTED SYSTEM

Subject Code	: **10EC831**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed systems, Resource sharing and the web, Challenges. **7 Hours**

UNIT - 2

SYSTEM MODELS: Introduction, Architectural models, Fundamental mode. **6 Hours**

UNIT - 3

INTERPROCESS COMMUNICATION: Introduction, The API for the internet protocols, External data representation and marshalling, Clint-server communication, Group communication. **7 Hours**

UNIT - 4

DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications. **6 Hours**

PART – B

UNIT - 5

SECURITY: Introduction, Overview of security technique cryptographic algorithms, Digital signature, Cryptography progrmatics. **7 Hours**

UNIT - 6

TIME & GLOBAL STATES: Introduction, Clocks, Events, Process states, Synchronizing physical clocks, Global states, Distributed debugging.

7 Hours

UNIT - 7

COORDINATION AND AGREEMENT: Distributed mutual exclusion, Elections, Multicast communication. **6 Hours**

UNIT - 8

CORBA CASE STUDY: Introduction, CORBA RMI, CORBA Services.

6 Hours

TEXT BOOK:

1. **“Distributed Systems, Concepts & Design”**, George Coulouris, Jeam Dollimore, Tim Kindberg, fourth edition, 2006. Pearson education.

REFERENCE BOOK:

1. **“Distributed System Architecture, a Middleware Approach”** Arno puder, Kay Romer, Frank Pilhofer, Morgan Kaufmann publishers.

NETWORK SECURITY

Subject Code	: **10EC832**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
Services, mechanisms and attacks, The OSI security architecture, A model for network security. **6 Hours**

UNIT - 2
SYMMETRIC CIPHERS: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher. **7 Hours**

UNIT - 3
Principles of Public-Key Cryptasystems, The RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions. **6 Hours**

UNIT - 4
Digital signatures, Authentication Protocols, Digital Signature Standard. **7 Hours**

PART – B

UNIT - 5
Web Security Consideration, Security socket layer (SSL) and Transport layer security, Secure Electronic Transaction. **6 Hours**

UNIT - 6
Intruders, Intrusion Detection, Password Management. **6 Hours**

UNIT - 7
MALICIOUS SOFTWARE: Viruses and Related Threats, Virus Countermeasures. **7 Hours**

UNIT - 8
Firewalls Design Principles, Trusted Systems. **6 Hours**

TEXT BOOK:

1. **Cryptography and Network Security**, William Stalling, Pearson Education, 2003.

REFERENCE BOOKS:

1. **Cryptography and Network Security**, Behrouz A. Forouzan, TMH, 2007.
2. **Cryptography and Network Security**, Atul Kahate, TMH, 2003.

OPTICAL NETWORKS

Subject Code	: **10EC833**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

INTRODUCTION TO OPTICAL NETWORKS: Telecommunication networks, First generation optical networks, Multiplexing techniques, Second generation optical networks, System and network evolution. Non linear effects SPM, CPM, four wave mixing, Solitons. **7 Hours**

UNIT - 2

COMPONENTS: Couplers, isolators and Circulators, Multiplexes and filters Optical amplifiers.

6 Hours

UNIT - 3

Transmitters, detectors, Switches, Wavelength converters. **6 Hours**

UNIT - 4

TRANSMISSION SYSTEM ENGINEERING: System model, Power penalty, Transmitter, receiver, optical amplifiers, Crosstalk, Dispersion, Overall design Consideration.

7 Hours

PART – B

UNIT - 5

FIRST GENERATION NETWORKS: SONET/SDH, Computer interconnects, Mans, Layered architecture for SONET and second generation networks. **6 Hours**

UNIT - 6

WAVELENGTH ROUTING NETWORKS: Optical layer, Node design, Network design and operation, routing and wavelength assignment architectural variations. **6 Hours**

UNIT - 7

VIRTUAL TOPOLOGY DESIGN: Virtual topology design problem, Combines SONET/WDM network design, an ILP formulation, Regular virtual topologies, Control and management, Network management configuration management, Performance management, fault management.

7 Hours

UNIT - 8

ACCESS NETWORKS: Network architecture overview, present and future access networks, HFC, FTTC, Optical access networks Deployment considerations, Photonic packet switching, OTDM, Multiplexing and demultiplexing Synchronisation. **7 Hours**

TEXT BOOK:

1. **Optical networks: A practical perspective** Kumar Sivarajan and Rajiv Ramaswamy: Morgan Kauffman 1998.

REFERENCE BOOKS:

1. **Optical Communication Networks**: Biswajit Mukherjee: TMG 1998.
2. **Optical Networks**, Ulysees Black: Pearson education 2007.

HIGH PERFORMANCE COMPUTER NETWORKS

Subject Code	: **10EC834**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

History of Communication Networks, Networking principles, Future networks Internet, Pure TAM Network, Cable Network, Wireless.

6 Hours

UNIT - 2

NETWORK SERVICES AND LAYERED ARCHITECTURE: Applications, Traffic characterization and quality of services, Network services, High performance networks, Network Elements., Layered applications, Open data network model, Network architectures, Network bottlenecks. **7 Hours**

UNIT - 3

INTERNET AND TCP/IP NETWORKS: Multicast IP, Mobile IP, TCP and UDP, Applications, FTP, SMTP. Internet success and limitations, Performance of TCP/IP Networks, Performance of circuit switched networks.

7 Hours

UNIT - 4

SONET, DWDM, FTH, DSL, Intelligent networks CATV. **6 Hours**

PART – B

UNIT - 5

ATM: Main features of ATM, Addressing, signaling and Routing, ATM header structure, ATM AAL, Internetworking with ATM.

6 Hours

UNIT - 6

WIRELESS NETWORKS: Link level design, Channel Access, Network design, Wireless networks today, Future networks, ad hoc networks, High speed Digital cellular, Home RF and Bluetooth. **7 Hours**

UNIT - 7

Control of networks, Objectives and methods of control, Circuit switched networks, Datagram Networks Network economics, Derived demand for network services, ISPs, subscriber demand model, Empirical model.

7 Hours

UNIT - 8

OPTICAL NETWORKS: WDM systems, Optical cross connects, Optical LANs, Optical paths and networks. **6 Hours**

TEXT BOOK:

1. **High Performance Communication Networks,** Warland and Varaiya: Morgan Kauffman/ Elsivier 2nd Edition 2000.

REFFRENCE BOOKS:

1. **High-Speed Networks and Internet: Performance and Quality of service**, William Stallings, Pearson Edu., 2001.
2. **Building High-Speed Networks**, Tere Parnell, TMGH, 2000.

INTERNET ENGINEERING

Subject Code	: **10EC835**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1
INTRODUCTION: Communication model, Communication software, and communication protocol: Representation, Development methods, Protocol engineering process. NETWORK REFERENCE MODEL**:** Layered architecture, Network services and interfaces, protocol functions, OSI model, TCP/IP protocol suite, Application protocols. **7 Hours**

UNIT - 2
PROTOCOL SPECIFICATION: Communication service specification, Protocol entity specification, Interface specifications, Interactions, Multimedia protocol specifications, Internet protocol specifications.
6 Hours

UNIT - 3
SPECIFICATION AND DESCRIPTION LANGUAGE (SDL): A protocol specification language: SDL. **6 Hours**

UNIT - 4
Examples of SDL based protocol specifications, Other protocol specification languages. Protocol Verification And Validation, Protocol verification, Verification of a protocol using finite state machines. **7 Hours**

PART – B

UNIT - 5
Protocol validation, Protocol design errors, and protocol validation approaches, SDL based protocol verification, SDL based protocol validation.
6 Hours

UNIT - 6
PROTOCOL CONFORMANCE TESTING: Conformance testing methodology and framework, Conformance test architectures, Test sequence generation methods, Distribute architecture by local methods, Conformance testing with TTCN, Conformance testing of RIP, Multimedia applications testing, SDL based tools for conformance testing. **7 Hours**

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

7 Hours

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis. **6 Hours**

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.
2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –V (GROUP E)
MULTIMEDIA COMMUNICATIONS

Subject Code	: **10EC841**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS. **6 Hours**

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video. **7 Hours**

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

6 Hours

UNIT - 4

AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

7 Hours

PART – B

UNIT - 5

MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

6 Hours

UNIT - 6

THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8. **7 Hours**

UNIT - 7

BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs. **6 Hours**

UNIT - 8

TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP. **7 Hours**

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **"Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing"**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **"Multimedia Systems Design"**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

REALTIME OPERATING SYSTEMS

Subject Code	: **10EC842**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT 1

Introduction to Real-Time Embedded Systems: Brief history of Real Time Systems, A brief history of Embedded Systems. **6 Hours**

UNIT 2

System Resources: Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Esecutive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions. **7 Hours**

UNIT 3

Processing: Preemptive Fixed-Priority Policy, Feasibility, Rate Montonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies. **6 Hours**

UNIT 4

I/O Resources:

Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture.

Memory:

Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash filesystems. **7 Hours**

PART – B

UNIT 5

Multiresource Services:

Blocking, Deadlock and livestock, Critical sections to protect shared resources, priority inversion.

Soft Real-Time Services:

Missed Deadlines, QoS, Alternatives to rate monotonic policy, Mixed hard and soft real-time services. **7 Hours**

UNIT 6

Embedded System Components:

Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:

Execptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

7 Hours

UNIT 7

Performance Tuning:

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations. **6 Hours**

UNIT 8

High availability and Reliability Design:

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. **(Chap 13 of book Myke Predko)**

7 Hours

REFERENCE BOOKS:

1. "**Real-Time Embedded Systems and Components"** Sam Siewert, Cengage Learning India Edition, 2007.
2. " **Programming and Customizing the PIC microcontroller" ,** Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: **10EC843**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers. **6 Hours**

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. **7 Hours**

UNIT - 3

GSM LOGICAL CHANNELS AND FRAME STRUCTURE: Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. **7 Hours**

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. MESSAGES, SERVICES, AND CALL FLOWS IN GSM: Introduction, GSM PLMN services.

7 Hours

PART – B

UNIT - 5

GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover. Data services, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

6 Hours

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

6 Hours

UNIT - 7

PLANNING AND DESIGN OF A GSM WIRELESS NETWORK: Introduction, Tele traffic models, Call model, Topology model, Mobility in cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system.

7 Hours

UNIT - 8

MANAGEMENT OF GSM NETWORKS: Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

7 Hours

TEXT BOOK:

1. **"Principles of Applications of GSM"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. **GSM: Evolution towards 3rd Generation Systems**, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998
2. **GSM & UMTS: The Creation of Global Mobile Communication,** Friedhelm Hillebrand, John Wiley & Sons; 2001.

ADHOC WIRELESS NETWORKS

Subject Code	: **10EC844**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. **6 Hours**

UNIT - 2

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks, Classification of MAC protocols. **7 Hours**

UNIT - 3

Contention - based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols. **6 Hours**

UNIT - 4

ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol. **7 Hours**

PART – B

UNIT - 5

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.

6 Hours

UNIT - 6

TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks. **7 Hours**

UNIT - 7

SECURITY: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

6 Hours

UNIT - 8

QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS: Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions. **7 Hours**

TEXT BOOK:

1. **“Ad hoc wireless Networks”**, C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2nd Edition, reprint 2005.

REFERENCE BOOKS:

1. **"Ad hoc wireless Networks"**, Ozan K. Tonguz and Gianguigi Ferrari, Wiley
2. **"Ad hoc wireless Networking"**, Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic publishers.

OPTICAL COMPUTING

Subject Code	: **10EC845**	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT - 1

MATHEMATICAL AND DIGITAL IMAGE FUNDAMENTALS: Introduction, Fourier Transform, discrete Fourier transform, basic diffraction theory, Fourier transform property of lens , sampling and quantization, image enhancement, image restoration. **7 Hours**

UNIT - 2

LINER OPTICAL PROCESSING: Introduction, photographic film, spatial filtering using binary filters, holography, inverse filtering, Deblurring. **6 Hours**

UNIT - 3

ANALOG OPTICAL ARITHMETIC: Introduction, Halftone processing, nonlinear optical processing, Arithmetic operations. **6 Hours**

UNIT - 4

RECOGNITION USING ANALOG OPTICAL SYSTEMS: Introduction, Matched filter, Joint transform correlation, Phase-only filter, Amplitude modulated recognition filters, Generalized correlation filter, Melllin transform based correlation. **7 Hours**

PART – B

UNIT - 5

DIGITAL OPTICAL COMPUTING DEVICES: Introduction, Nonlinear devices, Integrated optics, Threshold devices, Spatial high modulators, Theta modulation devices. **6 Hours**

UNIT - 6

SHADOW-CASTING AND SYMBOLIC SUBSTITUTION: Introduction, Shadow casting system and design algorithm, POSC logic operations, POSC multiprocessor, Parallel ALU using POSC, Sequential ALU using POSC, POSC image processing, Symbolic substitutions, Optical implementation of symbolic substitution, Limitations and challenges. **7 Hours**

UNIT - 7

OPTICAL MATRIX PROCESSING: Introduction, Multiplication, Multiplication using convolution, Matrix operations, Cellular logic architecture, Programmable logic array. **6 Hours**

UNIT - 8

ARTIFICIAL INTELLIGENT COMPUTATIONS: Introduction, Neural networks, Associative memory, Optical implementations, Interconnections, Artificial Intelligence. **7 Hours**

TEXT BOOK:

1. **"Optical Computing An Introduction"**, Mohammed A. Karim, John Wiley & Sons, 1992.

REFERENCE BOOKS:

1. **Optical Signal Processing** by Vanderlugnt John willy & sons NY 1992.
2. **Signal Processing in Optics** - Bradly G Boore Oxford University Press 1998.

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Electrical and Electronics Engineering

FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus-Dated 16th and 17th April 2010

SCHEME OF TEACHING & EXAMINATION

III SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code	Title	Teaching Dept.	Teaching hours/week		Examination			
			Theory	Practical	Duration in hours	Marks		
						I. A	Theory/ Practical	Total Marks
10MAT31	Engineering Mathematics - III	Mat	04	-	03	25	100	125
10ES32	Analog Electronic Circuits	@	04	-	03	25	100	125
10ES33	Logic Design	@	04	-	03	25	100	125
10ES34	Network Analysis	@	04	-	03	25	100	125
10EE35	Electrical and Electronic Measurements And Instrumentation	E&EE	04	-	03	25	100	125
10EE36	Electric Power Generation	E&EE	04	-	03	25	100	125
10ESL37	Analog Electronics Lab	@	-	03	03	25	50	75
10ESL38	Logic Design Lab	@	-	03	03	25	50	75
		Total	24	06	24	200	700	900

Note : @ indicates concerned discipline. ES (for theory) & ESL (for Lab) in the subject code indicates that the subject is common to electrical and electronics stream consisting of EE/EC/IT/TC/ML/BM branches of engineering. EE indicates, subjects specific to E & EE branch only.

FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

IV SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code	Title	Teaching Dept.	Teaching hours/week		Examination			
			Theory	Practical	Duration in hours	Marks		
						I. A	Theory/ Practical	Total Marks
10MAT 41	Engineering Mathematics - IV	Mat	04	-	03	25	100	125
10ES42	Microcontrollers	@	04	-	03	25	100	125
10ES43	Control Systems	@	04	-	03	25	100	125
10EE44	Field Theory	E&EE	04	-	03	25	100	125
10EE45	Power Electronics	E&EE	04	-	03	25	100	125
10EE46	Transformers and Induction Machines	E&EE	04	-	03	25	100	125
10ESL47	Microcontrollers Lab	@	-	03	03	25	50	75
10EEL48	Power Electronics Lab	E&EE	-	03	03	25	50	75
		Total	24	06	24	200	700	900

Note : @ indicates concerned discipline. ES (for theory) & ESL (for Lab) in the subject code indicates that the subject is common to Electrical and Electronics stream consisting of EE/EC/IT/TC/ML/BM branches of engineering. EE indicates, subjects specific to E & EE branch only.

FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

V SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
01	10AL51	Management and Entrepreneurship	@	4	-	3	25	100	125
02	10EE52	Signals and Systems	E&EE	4	-	3	25	100	125
03	10EE53	Transmission and Distribution	E&EE	4	-	3	25	100	125
04	10EE54	D.C. Machines and Synchronous Machines	E&EE	4	-	3	25	100	125
05	10EE55	Modern Control theory	E&EE	4	-	3	25	100	125
06	10EE56	Linear IC's and Applications	E&EE	4	-	3	25	100	125
07	10EEL57	Measurements and Circuit Simulation Laboratory	E&EE	-	3	3	25	50	75
08	10EEL58	Transformers and Induction Machines Laboratory	E&EE	-	3	3	25	50	75
Total				24	06	24	200	700	900

@- Any Engineering department or department of Business study.

FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

VI SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE61	Power System Analysis and Stability	E&EE	4	-	3	25	100	125
2	10EE62	Switchgear & Protection	E&EE	4	-	3	25	100	125
3	10EE63	Electrical Machine Design	E&EE	4	-	3	25	100	125
4	10EE64	Digital Signal Processing	E&EE	4	-	3	25	100	125
5	10EE65	CAED (Computer Aided Electrical Drawing)	E&EE	1	3	3	25	100	125
6	10EE66X	Elective-I (Group A)	E&EE	4	-	3	25	100	125
7	10EEL67	D.C. Machines and Synchronous Machines Laboratory	E&EE	-	3	3	25	50	75
8	10EEL68	Control Systems Laboratory	E&EE	-	3	3	25	50	75
		Total		21	09	24	200	700	900

Elective-I (Group A)

10EE661- Operation Research
10EE662 - Advanced Power Electronics
10EE663 – Fuzzy Logic
10EE664 - Object Oriented Programming using C++
10EE665 - Embedded Systems
10EE666 – Electri cal Engineering Materials.

FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

VII SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE71	Computer Techniques in Power System Analysis	E&EE	4	-	3	25	100	125
2	10EE72	Electrical Power Utilization	E&EE	4	-	3	25	100	125
3	10EE73	High Voltage Engineering	E&EE	4	-	3	25	100	125
4	10EE74	Industrial Drives and Applications	E&EE	4	-	3	25	100	125
5	10EE75X	Elective-II (Group B)	E&EE	4	-	3	25	100	125
6	10EE76X	Elective-III (Group C)	E&EE	4	-	3	25	100	125
7	10EEL77	Relay and High Voltage Laboratory	E&EE	-	3	3	25	50	75
8	10EEL78	Power System Simulation Laboratory	E&EE	-	3	3	25	50	75
Total				24	06	24	200	700	900

Elective-II (Group B)
10EE751 - HVDC Transmission
10EE752 - Programmable Logic Controllers
10EE753 - Artificial Neural Network
10EE754 - Operating System
10EE755 - Digital System with VHDL
10EE756 -Testing and Commissioning of Electrical Equipment

Elective-III (Group C)
10EE761 - Power System Planning
10EE762 - Computer Control of Electrical Drives
10EE763 - Data Structure
10EE764 - VLSI Circuits and Design
10EE765 - Micro & Smart System Technology
10EE766 - Electromagnetic Compatibility

FINAL SCHEME OF TEACHING & EXAMINATION AND SYLLABUS - DATED 16TH AND 17TH APRIL 2010

VIII SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE81	Electrical Design, Estimating and Costing	E&EE	4	-	3	25	100	125
2	10EE82	Power System Operation and Control	E&EE	4	-	3	25	100	125
3	10EE83X	Elective-IV (Group D)	E&EE	4	-	3	25	100	125
4	10EE84X	Elective-V (Group E)	E&EE	4	-	3	25	100	125
5	10EEP85	Project Work	E&EE	-	6	3	100	100	200
6	10EES86	Seminar (on a latest topic relevant to the branch and independent of the project work)	E&EE	-	3	-	50	-	50
Total				16	09	15	250	500	750

Elective-IV (Group-D)

10EE831 - Reactive Power Management
10EE832 - Flexible A.C. Transmission Systems (FACTS)
10EE833- Advanced Instrumentation System
10EE834 - AI Applications to Power Systems
10EE835 - Data Base Management Systems (DBMS)
10EE836 - Renewable Energy Sources

Elective-V (Group-E)

10EE841 - Power Systems Dynamics and Stability
10EE842 - Energy Auditing & Demand Side management
10EE843 - Data communications and Networking
10EE844 - Electrical Distribution Systems
10EE845 - Insulation Engineering
10EE846 - Intellectual Property Rights
10EE847 - Electrical Power Quality

10MAT31 ENGINEERING MATHEMATICS – III

Sub Code	:	**10MAT31**	***IA Marks***	:	**25**
Hrs/ Week	:	**04**	Exam Hours	:	**03**
Total Hrs.	:	**52**	**Exam Marks**	:	**100**

PART-A

UNIT-1
Fourier series
Convergence and divergence of infinite series of positive terms, definition and illustrative examples* Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis.

7 Hours

UNIT-2
Fourier Transforms
Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms

6 Hours

UNIT-3
Application of PDE
Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensiona l wave equation.

6 Hours

UNIT-4
Curve Fitting and Optimisation
Curve fitting by the method of least squares- Fitting of curves of the form $y = ax + b$, $y = a x^2 + b x + c$, $y = a e^{bx}$, $y = ax^b$
Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

7 Hours

PART-B

UNIT-5
Numerical Methods - 1
Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

6 Hours

UNIT-6
Numerical Methods – 2
Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

7 Hours

UNIT-7

Numerical Methods – 3
Numerical solutions of PDE – finite difference appr oximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations

7 Hours

UNIT-8
Difference Equations and Z-Transorms
Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule , shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

6 Hours

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

10ES32 ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ES32**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers.
6 Hours

UNIT 2:

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. **6 Hours**

UNIT 3:

Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_e model; analysis of CE configuration using h- parameter model; Relationship between h-parameter model of CE,CC and CE configuration. **7 Hours**

UNIT 4:

Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. **7 Hours**

PART – B

UNIT 5:

(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections. **3 Hours**

(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers.
4 Hours

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers. **7 Hours**

UNIT 7:

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only)

Simple design methods of Oscillators. **6 Hours**

UNIT 8:

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

6 Hours

TEXT BOOK:

1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:

1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 2nd Edition, 2010
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004
3. " **Analog Electronics Circuits: A Simplified Approach"** , U.B. Mahadevaswamy, Pearson/Saguine, 2007.

10ES33 LOGIC DESIGN (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ES33**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES34 NETWORK ANALYSIS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10ES34	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Basic Concepts: Basic definitions. Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

7 Hours

UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, solution of resistive networks, principle of duality**.**

7 Hours

UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems

6 Hours

UNIT 4:
Network Theorems - II:
Thevenin's and Norton's theorems, Maximum Power tra nsfer theorem

6 Hours

PART – B

UNIT 5:
Resonant Circuits: Series and parallel resonance, frequency-response of series and parallel circuits, Q factor, Bandwidth. **6Hours**

UNIT 6:
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. **7 Hours**

UNIT 7:
Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis

7 Hours

UNIT 8:
Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets

6 Hours

TEXT BOOKS:
1. **Engineering Circuit Analysis,** Hayt, Kemmerly and Durbin,TMH ,7th Edition, 2010

2. **Networks and systems,** Roy Choudhury, New Age International Publications.,2nd edition, 2006 re-print,

REFERENCE BOOKS:

1. **Electric Circuits,** Schaum's Outlines,M Nahvi & J A Edminister,TMH,5th Edition,2009.
2. **Network Analysis,** M. E. Van Valkenburg, PHI, 3rd Edition, Reprint 2009.
3. **Analysis of Linear Systems**, David K. Cheng, Narosa Publishing House, 11th reprint, 2002

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours 1-(b) Measurement of Resistance:** Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:
Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's brid ge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:
Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:
Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory , errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:
(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**
(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**
UNIT 6:
Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:
Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.
0**6 Hours**
UNIT 8:
(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours
(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. **4 Hours**

Text Books

1. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2nd Edition, 2009.
2. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	**10EE36**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**
UNIT 2:
Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:
(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**
(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**
UNIT 4:
Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:
(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.
(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 14 **Hours**
UNIT 7 and 8 :
Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system. Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**
Text Books

1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.
2. **Electric Power Generation, Transmission and Distribution,** **S.** N. Singh, PHI, 2^{nd} Edition,2009.

References

1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ESL37 ANALOG ELECTRONICS LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ESL37**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

NOTE: Use the Discrete components to test the circuits. LabView can be used for the verification and testing along with the above.

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain-frequency response, input and output impedances.

2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)

3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)

4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz

5. Testing for the performance of BJT – Hartley & C olpitts Oscillators for RF range $f_0 \geq 100$KHz.

6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz

7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection

8. Testing of Clamping circuits: positive clamping /negative clamping.
9. Testing of a transformer less Class – B push pul l power amplifier and determination of its conversion efficiency.

10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.

12. Characteristics of Series and Parallel resonant circuits.

10ESL38 LOGIC DESIGN LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ESL38**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

NOTE: Use discrete components to test and verify the logic gates. LabView can be used for designing the gates along with the above.

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip
   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circ uits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Wiring and testing Ring counter/Johnson counter.
12. Wiring and testing of Sequence generator.

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10MAT41 ENGINEERING MATHEMATICS – IV

Subject Code	:	10MAT41	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT-1
Numerical Methods- 1
Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Ru nge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

6 Hours

UNIT-2
Numerical Methods – 2
Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge - Kutta method of fourth-order.
Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

6 Hours

UNIT-3
Complex variables – 1
Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.
Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

7 Hours

UNIT-4
Complex variables – 2
Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals- Cauchy's theorem and Cauchy's integral formula.

7 Hours

PART-B

UNIT-5
Special Functions
Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first

kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

7 Hours

UNIT-6
Probability Theory - 1
Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

6 Hours

UNIT-7
Probability Theory- 2
Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson di stributions; Exponential and normal distributions.

7 Hours

UNIT-
Sampling Theory
Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

6 Hours

Text Books:
1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:
1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

10ES 42 MICROCONTROLLERS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ES42**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1**:**

Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.

The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

6 Hours

UNIT 2:

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

6 Hours

UNIT 3:

8051 programming: Assembler directives, Assembly language programs and Time delay calculations. 6 Hours

UNIT 4:

8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

7 Hours

PART – B

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .
6 Hours

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.

8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

6 Hours

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

2 Hours

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

2 Hours

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

3 Hours

Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins. **2 Hours**

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

2 Hours

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

2 Hours

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – R eal-time clock.

2 Hours

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

3 Hours

TEXT BOOKS:

1. “The 8051 Microcontroller and Embedded Systems – us ing assembly and C ”-, **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006**
2. “MSP430 Microcontroller Basics”, **John Davies, Elsevier, 2010**
(Indian edition available)

REFERENCE BOOKS:

1. “The 8051 Microcontroller Architecture, Programmin g & Applications”, **2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.**
2. **“** The 8051 Microcontroller”, **V.Udayashankar and MalikarjunaSwamy, TMH, 2009**
3. MSP430 Teaching CD-ROM, **Texas Instruments, 2008 (can be requested** http://www.uniti.in **)**
4. Microcontrollers: Architecture, Programming, Interfacing and System Design”, **Raj Kamal, “Pearson Education, 2005**

10ES43 CONTROL SYSTEMS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ES43**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Modeling of Systems: Introduction to Control Systems, Types of control systems, Effect of feedback systems, Differential equations of physical systems – Mechanical systems- Friction, Translational syst ems (Mechanical accelerometer, Levered systems excluded), Rotational systems, Gear trains. Electrical systems, Analogous systems. **6 Hours**

UNIT 2:
Block diagrams and signal flow graphs: Transfer functions, Block diagrams, Signal Flow graphs (State variable formulation excluded). **7 Hours**

UNIT 3:
Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. **7Hours**

UNIT 4:
Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh-Hurwitz stability criterion, Relative stability analysis; Special cases of RH criterion. **6 Hours**

PART – B

UNIT 5:
Root–Locus Techniques : Introduction, basic properties of root loci, Construction of root loci. **6 Hours**

UNIT 6:
Stability analysis in frequency domain: Introduction, Mathematical preliminaries, Nyquist Stability criterion, (Inverse polar plots excluded), Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded). **7Hours**

UNIT 7:
Frequency domain analysis: Correlation between time and frequency response, Bode plots, All pass and minimum phase systems, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. **7 Hours**

UNIT 8:
Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations. **6 Hours**

TEXT BOOK :

1. Control Systems Engineering, I. J. Nagarath and M.Gopal, New Age International (P) Limited, 4th Edition – 2005

2 Modern Control Engineering, K. Ogata, PHI, 5th Edition, 2010.

REFERENCE BOOKS:

1. **Control Systems Engineering,**Norman S Nise,Wiley Student Edition,5th Edition,2009
2. **Automatic Control Systems**, Benjamin C.Kuo and Farid Golnaaghi, Wiley Student Edition,8th Edition,2009
3. **Feedback and Control Systems**,Joseph J Distefano III and other, Schaum's Outlines,TMH,2nd Edition,2007
4. **Control Systems**, Ananda Kumar, PHI,2009.

10EE44 FIELD THEORY

Subject Code	:	**10EE44**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT -1
a. Coulomb's Law and electric field intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge. **03 Hours**

b. **Electric flux density, Gauss' law and divergence:** Electric flux density, Gauss' law, Divergence, Maxwell's First equation (Electrostatics), vector operator and divergence theorem **04 Hours**
UNIT- 2
a. **Energy and potential:** Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient, Energy density in an electrostatic field **04 Hours b. Conductors, dielectrics and capacitance:** Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, boundary conditions for perfect dielectrics, capacitance and examples. **03 Hours**

UNIT- 3
Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations. **06 Hours**
UNIT -4
The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials. **06 Hours**

PART – B

UNIT- 5
a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

03 Hours

b. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance.

04 Hours

UNIT-6

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's e quation in point and Integral form, retarded potentials.

06 Hours

UNIT- 7

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors, skin effect.

07HOURS

UNIT- 8

Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions. **06 Hours**

TEXT BOOK:

1. **Engineering Electromagnetics,** William H Hayt Jr. and John A Buck**,** Tata McGraw-Hill, 7th edition, 2009.
2. **Principles of Electromagnetics,** Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2009.

REFERENCE BOOKS:

1. **Electromagnetics with Applications,** John Krauss and Daniel A Fleisch, McGraw-Hill, 5th edition, 1999.
2. **Electromagnetism-Theory and Applications,** Ashutosh Pramanik, PHI, 2nd edition,Reprint 2009.
3. **Field and Wave Electromagnetics**, David K Cheng, Pearson Education Asia, 2nd edition, - 1989, Indian Reprint – 2001.

10EE45 POWER ELECTRONICS

Subject Code	:	**10EE45**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Power Semiconductor Devices:

Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.

7 hours

UNIT 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:

Thyristors

Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**

UNIT 4:

Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters.
7 Hours

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a)AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.

2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and De sign,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

10EE46 TRANSFORMERS AND INDUCTION MACHINES

Subject Code	:	10EE46	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Basic Concepts: Principle of operation of transformer, Constructional details of shell type and core type single-phase and three-phase transformers. EMF equation, operation of practical power transformer under no load and on load (with phasor diagrams).Concept of ideal transformers, current inrush in transformers.
6 Hours

UNIT 2:
Single-phase Transformers: Equivalent circuit, losses, efficiency, condition for maximum efficiency, all day efficiency. Open circuit and Short circuit tests, calculation of parameters of equivalent circuit. Regulation, predetermination of efficiency and regulation. Polarity test, Sumpner's test.
6 Hours
UNIT 3:
Parallel operation - need, conditions to be satisfied for parallel operation. Load sharing in case of similar and dissimilar transformers. Auto-transformers, copper economy. Brief discussion on constant voltage transformer, constant current transformer. **6 Hours**
UNIT 4:
Three-phase Transformers: Introduction, choice between single unit three-phase transformer and bank of single-phase transformers. Transformer connection for three phase operation – star/star,delta/delta,star/delta,zigzag/star and vee/vee,choice of connection. Phase conversion - Scott connection for three-phase to two-phase conversion. Labeling of three-phase transformer terminals, phase shift between primary and secondary and vector groups. Conditions for parallel operation of three-phase transformers,load sharing. Equivalent circuit of three-phase transformer. **8 Hours**

PART – B

UNIT 5:
Basic Concepts of three phase Induction Machines: Concept of rotating magnetic field. Principle of operation, construction, classification and types - single-phase, three-phase, squirrel-cage, slip-ring. Slip, torque, torque-slip characteristic covering motoring, generating and braking regions of operation. Maximum torque**. 7 Hours**
UNIT 6:
Three-phase Induction Motor: Phasor diagram of induction motor on no-load and on load. equivalent circuit Losses, efficiency, No-load and blocked rotor tests. Circle diagram and performance evaluation of the motor. Cogging and crawling. **6Hours**
UNIT 7:
High torque rotors-double cage and deep rotor bars.Equivalent circuit and performance evaluation of double cage induction motor. Induction generator – externally excited and self excited. Importance of induction generators in windmills. **6 Hours**

UNIT 8:
(a) Starting and speed Control of Three-phase Induction Motors: Need for starter. Direct on line (DOL), Star-Delta and autotransformer starting. Rotor resistance starting. Soft(electronic) starters. Speed control - voltage, frequency, and rotor resistance. **4 Hours**

(b) Single-phase Induction Motor: Double revolving field theory and principle of operation. Types of single-phase induction motors: split-phase, capacitor start, shaded pole motors. Applications. **3 Hours**

Text Books

1. **Electric Machines,** I. J. Nagrath and D. P. Kothari, T.M.H,4th Edition,2010.
2. **Electric Machines,** Mulukuntla S.Sarma, Mukesh K.Pathak, Cengage Learing,First edition,2009.

References

1. **Performance and Design of A.C. Machines,** M. G. Say,C.B.S. Publishers, 3rd Edition,2002.
2. **Theory of Alternating Current Machines,** Alexander Langsdorf, T.M.H, 2nd edition,2001..
3. **Electrical Machines and Transformers,** Kosow, Pearson, 2nd edition, 2007.
4. **Transformers,** BHEL, TMH,2nd Edition, Eight reprint 2008.

10ESL47 MICROCONTROLLERS LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10EEL47**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bit s Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).

5. Conditional CALL & RETURN.

6. Code conversion: BCD – ASCII; ASCII – Decimal; D ecimal - ASCII; HEX - Decimal and Decimal - HEX .

7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.

9. Alphanumeric LCD panel and Hex keypad input interface to 8051.

10. External ADC and Temperature control interface to 8051.

11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.

12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	**10EEL48**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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10AL51 Management and Entrepreneurship

Subject Code	:	10AL51	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

MANAGEMENT (PART – A)

UNIT - 1

MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of Management - Management as a Science, Art or Profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought-Early Management Approaches-Modern Management Approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

ORGANISING AND STAFFING: Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – Centralisation Vs Decentralisation of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief).

7 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control. **6 Hours**

ENTREPRENEURSHIP (PART – B)

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

6 Hours

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I., Effect of WTO/GATT Supporting Agencies of Government for S.S.I Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only). **7 Hours**

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single

Window Agency: SISI; NSIC; SIDBI; KSFC.

6 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities - Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study. **7 Hours**

TEXT BOOKS:

1. **Principles of Management** - P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th Edition, 2010.
2. **Dynamics of Entrepreneurial Development & Management** - Vasant Desai Himalaya Publishing House.
3. **Entrepreneurship Development** - Small Business Enterprises - Poornima M Charantimath - Pearson Education – 2006.

REFERENCE BOOKS:

1. **Management Fundamentals** - Concepts, Application, Skill Development Robert Lusier – Thomson.
2. **Entrepreneurship Development** - S S Khanka - S Chand & Co.
3. **Management** - Stephen Robbins - Pearson Education /PHI -17th Edition, 2003.

10EE52 SIGNALS AND SYSTEMS

Subject Code	:	10EE52	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION-Definitions of signals and a system, classification of signals, basic operations on signals, elementary signals viewed as interconnections of operations, properties of systems. **10 Hours**

UNIT – 2 and 3

TIME – DOMAIN REPRESENTATIONS FOR LTI SYSTEMS- Convolution, impulse response, properties, solution of differential and difference equations, block diagram representation. **10 Hours**

UNIT - 4

FOURIER REPRESENTATION OF PERIODIC SIGNALS-Introduction, Fourier representation of continuous-time periodic signals (FS), properties of continuous-time Fourier series (excluding derivation of defining equations for CTFS), Fourier representation of discrete-time periodic signals, properties of discrete-time Fourier series (DTFS). **6 Hours**

PART - B

UNIT - 5

THE CONTINUOUS-TIME FOURIER TRANSFORM-Representation of a periodic signals: continuous-time Fourier transform (FT), Properties of continuous-time Fourier transform. Application; frequency response of LTI systems, Solutions of differential equations. **7 Hours**

UNIT - 6

THE DISCRETE-TIME FOURIER TRANSFORM-Representations of periodic signals: The discrete-time Fourier transform (DTFT), Properties of DTFT. Application; frequency response of LTI systems, Solutions of differential equations. **7 Hours**

UNIT –7 and 8

Z- TRANSFORMS-Introduction, Z-transform, properties of ROC, properties of Z-transforms, inversion of Z-transform methods - power series and partial expansion, Transforms analysis of LTI systems, transfer function, stability and causality, unilateral Z-transform and its application to solve difference equations.
12 Hours

TEXT BOOKS:

1. **Signals and Systems-** Simon Haykin and Barry Van Veen, John Wiley & Sons, 2nd Edition 2008.
2. **Fundamentals of Signals and Systems** - Michel J Roberts, TMH, 2nd Edition,2010.

REFERENCE BOOKS:

1. **Signals and Systems**, Alan V Oppenheim, Alan S. Willsky and S. Hamid Nawab,PHI, 2nd edition, 2009.
2. **Signals and Systems,** H P Hsu and others, Schaums Outline Series, TMH,2nd Edition,2008.

10EE53 TRANSMISSION AND DISTRIBUTION

Subject Code	:	**10EE53**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
TYPICAL TRANSMISSION & DISTRIBUTION SYSTEMS SCHEME-General layout of power system, Standard voltages for transmission, advantages of high voltage transmission. Transmission line efficiency and line drop. Feeders, distributors & service mains. **5 Hours**

UNIT - 2
OVERHEAD TRANSMISSION LINES- Types of supporting structures and line conductors used. Sag calculation- supports at same level and at different levels. Effect of wind and ice, Sag at erection, Stringing chart and sag templates. Line vibrators. **5 Hours**

UNIT – 3
INSULATORS- Introduction, materials used, types, potential distribution over a string of suspension insulators. String efficiency & methods of increasing strings efficiency, grading rings and arcing horns. Testing of insulators. **6 Hours**

UNIT - 4
(A)CORONA- Phenomena, disruptive and visual critical voltages, corona power loss. Advantages and disadvantages of corona. **4 Hours**
(B)**UNDERGROUND CABLES**- Types, material used, insulation resistance, thermal rating of cables, charging current, grading of cables, capacitance grading & inter sheath grading, testing of cables.
6 Hours

Part - B

UNIT – 5 and 6
Line parameters: calculation of inductance of single phase line, 3phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Inductance of composite conductor lines. Capacitance- of single-phase line, 3phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Capacitance of composite conductor lines. **12 Hours**

UNIT - 7
Performance of power transmission lines- Short transmission lines, medium transmission lines- nominal T, end condenser and π models, long transmission lines, ABCD constants of transmission lines, Ferranti effect, line regulation. **8 Hours**

UNIT - 8
Distribution- Requirements of power distribution, radial & ring main systems, ac and dc distribution: calculation for concentrated loads and uniform loading. **6 Hours**

TEXT BOOKS:

1. **A Course in Electrical Power-** Soni Gupta & Bhatnaagar, Dhanpat Rai & Sons.
2. **Electrical Power Systems**- C. L. Wadhwa, New Age International,5th Edition,2009.

REFERENCE BOOKS:

1. **Elements of Power System Analysis**- W.D. Stevenson, TMH,4th Edition
2. **Electric power generation Transmission & Distribution**- S. M. Singh, PHI,2nd Edition, 2009.
3. **Electrical Power-** Dr. S. L. Uppal, Khanna Publications

10EE54 D.C. MACHINES AND SYNCHRONOUS MACHINES

Subject Code	:	**10EE54**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

DC GENERATOR-Review of basics of DC machines, classification of DC generator, types of armature winding, EMF equation, no-load characteristic, armature reaction, load characteristics. Commutation, types of Commutation, commutation difficulties, interpoles, compensating winding and equalizer rings (only qualitative treatment).

8 Hours

UNIT - 2

DC Motors- (a) Classification, Back EMF and its significance, Torque equation, Characteristics of shunt, series & compound motors, speed control of shunt, series and compound motors.Application of motors. DC motor starters

(b) Special DC motors- permanent magnet motors,brushless DC motors.Applications. **8 Hours**

UNIT – 3 and 4

LOSSES AND EFFICIENCY- Losses in DC machines, power flow diagram, efficiency, condition for maximum efficiency.

TESTING OF DC MACHINES- Direct & indirect methods of testing of DC machines-Brake test, Swinburn's test, Hopkinson's test, Retardation test , Field's test, merits and demerits of tests.

10 Hours

PART - B

UNIT - 5

SYNCHRONOUS MACHINES- Basic principle of operation, construction of salient & non-salient pole synchronous machines, generated EMF, effect of distribution and chording of winding, harmonics-causes, reduction and elimination. Armature reaction, synchronous reactance, leakage reactance, phasor diagram of non salient type alternator. **5 Hours**

UNIT - 6

VOLTAGE REGULATION: Voltage regulation by EMF, MMF, ZPF & ASA method.Schort circuit ratio and its importance.Two reaction theory-direct and quadrature axis reactances,phasor diagram.Slip test and regulation. **8 Hours**

UNIT - 7

Synchronizing to infinite bus bars, parallel operation of alternators. Operating characteristics, power angle characteristics excluding armature resistance, operation for fixed input and variable excitation, power flow equations including armature resistance, capability curves of synchronous generators. **6 Hours**

UNIT - 8

SYNCHRONOUS MOTOR: Principle of operation, phasor diagrams, torque and torque angle, Blondal diagram, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condensor, hunting and damping. Methods of starting synchronous motors. 7 Hours

TEXT BOOKS:

1. **Electrical machinery,** P.S Bhimbra, Khanna Publishers
2. **Electrical machines,** DP Kothari, I.J.Nagarath, TMH, 4^{th} edition, 2010.
3. **Electric Machines,** Mulukuntla S.Sarma, Mukesh K.Pathak, Cengage Learning, First edition,2009.

REFERENCE BOOKS:

1. **Performance & Design of Alternating Current machines**, M. G. Say, CBS publishers,3^{rd} Edition,2002.
2. **The Performance & Design of DC machines** A.E Clayton & N.N.Hancock CBS Publication,3^{rd} Edition,2004.
3. **Electrical Machines**,Ashfaq Hussain, Dhanpat Rai Publications.

10EE55 MODERN CONTROL THEORY

Subject Code	:	10EE55	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT – 1 and 2

STATE VARIABLE ANALYSIS AND DESIGN: Introduction, concept of state, state variables and state model, state modeling of linear systems, linearization of state equations. State space representation using physical variables, phase variables & canonical variables. **10 Hours**

UNIT - 3

Derivation of transfer function from state model, diagolization, Eigen values, Eigen vectors, generalized Eigen vectors. **6 Hours**

UNIT - 4

Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Cayley-Hamilton method, concept of controllability & observability, methods of determining the same. **10 Hours**

PART - B

UNIT - 5

POLE PLACEMENT TECHNIQUES: stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement, state regulator design, and design of state observer, Controllers- P, PI, PID. **10 Hours**

UNIT - 6

Non-linear systems: Introduction, behavior of non-linear system, common physical non linearity-saturation, friction, backlash, dead zone, relay, multi variable non-linearity.**3 Hours**

UNIT - 7

Phase plane method, singular points, stability of nonlinear system, limit cycles, construction of phase trajectories.**7 Hours**

UNIT - 8

Liapunov stability criteria, Liapunov functions, direct method of Liapunov & the linear system, Hurwitz criterion & Liapunov's direct method, construction of Liapunov functions for nonlinear system by Krasvskii's method. **6 Hours**

TEXT BOOKS:

1. **Digital control & state variable methods,** M. Gopal , 3rd Edition, TMH ,2008
2. **Control system Engineering,** I. J. Nagarath & M. Gopal, New Age International (P) Ltd, 3rd edition.

REFERENCE BOOKS:

1. **State Space Analysis of Control Systems,** Katsuhiko Ogata -PHI
2. **Automatic Control Systems,** Benjamin C. Kuo & Farid Golnaraghi, 8th edition, John Wiley & Sons 2009.
3. **Modern Control Engineering,** Katsuhiko Ogata, PHI,5th Edition, 2010
4. **Modern Control Engineering,** D. Roy Choudary,PHI, 4th Reprint,2009.
5. **Modern control systems**, Dorf & Bishop- Pearson education, 11th Edition 2008

10EE56 LINEAR IC'S AND APPLICATIONS

Subject Code	:	**10EE56**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

OP-AMPS AS AC AMPLIFIER: Capacitor coupled voltage follower, high Z_{in} capacitor coupled voltage follower, capacitor coupled non-inverting amplifier, high Z_{in} capacitor coupled non-inverting amplifier, capacitor coupled inverting amplifier, setting upper cut off frequency, capacitor coupled difference amplifier, and use of single polarity supply.**6 Hours**

UNIT 2

OP-AMPS FREQUENCY RESPONSE AND COMPENSATION: Op amp circuits stability, frequency and phase response, frequency compensating methods ,manufacturer's recommended compensation, op-amp circuit band width, slew rate effects,stray capacitance effects, load capacitance effects, Z_{in} mode compensation, circuit stability precautions.**7 Hours**

UNIT - 3

SIGNAL PROCESSING CIRCUITS: Precision half wave & full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample &hold circuit. DAC and ADC (Flash and successive approximations) 7 **Hours**

UNIT - 4

OPAMPS AND NONLINEAR CIRCUITS: Op-amps in switching circuits, zero crossing detectors, inverting Schmitt trigger circuits, non-inverting Schmitt circuits, astable multivibrator, and monostable multivibrator. **6 Hours**

PART - B

UNIT - 5

SIGNAL GENERATOR: Triangular/rectangular wave generator, waveform generator design, phase shift oscillator, oscillator amplitude stabilization, Wein bridge oscillator, signal generators, output controllers **7 Hours**

UNIT - 6

ACTIVE FILTERS: First and second order high pass and low pass filters, band pass filter, band stop filter. **7 Hours**

UNIT - 7

SPECIALIZED IC APPLICATIONS: Universal active filter, switched capacitor filter, phase locked loops, power amplifiers. **6 Hours**

UNIT - 8

DC VOLTAGE REGULATORS: Voltage regulators basics, voltage follower regulator, adjustable output regulator, precision voltage regulators, and integrated circuit voltage regulators. **6 Hours**

TEXT BOOKS:

1. **Operational amplifiers and linear IC's,** David A Bell, Oxford University Press, 2010.
2. **Operational amplifiers and linear IC's,** Ramakanth A Gayakwad, PHI, 4th edition,2009.
3. **Linear integrated circuits,**S.P.Bali,TMH,2009**.**

REFERENCE BOOKS:

1. **Op Amps and Linear Integrated Circuits-Concepts and Applications,** James M.Fiore,Cengage Learing,2009.
2. O**p Amps, Design, Applications and Trouble Shooting**,Elsevier,2nd Edition.
3. **Operational amplifiers and linear IC's,** Stanley William D, – 4th edition, Pearson Education**.**
4. **Linear Integrated Circuits- Analysis,Design and Applications,**B.Somanathan Nair, Wiley India, First,Edition, 2009.

10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.
12 Signal generator- triangular, saw tooth and rectangular wave generation

Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EEL58 TRANSFORMERS AND INDUCTION MACHINES LABORATORY

Subject Code	:	**10EEL58**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. (a)Predetermination of efficiency and regulation by Open Circuit and Short circuit tests on single - phase transformer.
   (b)Calculation of parameters of equivalent circuit from the readings of the tests and determination of efficiency and regulation from the equivalent circuit to correlate results obtained earlier.
2 Sumpner's test on similar transformers and determination of combined and individual transformer efficiency.
3.Parallel operation of two dissimilar (different kVA) single-phase transformers and determination of load sharing and analytical verification given the Open Circuit and Short circuit tests details.

4.Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load.
5. Scott connection with balanced and unbalanced resistive loads.
6. Load test on 3-phase induction motor- and plot of Torque versus speed, output hp versus efficiency, power factor and slip.
7. Predetermination of performance of 3-phase induction Motor from the Circle diagram.
8. (a)Determination of parameters of the equivalent circuit of a 3-phase Induction Motor by conducting NO load and Blocked rotor tests.
   (b)Determination of performance quantities of the induction motor from the equivalent circuit to correlate the results obtained from the load test or circle diagram.
9. Speed control of 3-phase induction motor by varying rotor resistance.
10. Load test on- induction generator.
11. Load test on single- phase induction motor.

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10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	10EE61	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams.
Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	10EE62	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Cir cuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, li ghtning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over sp eeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS: ,

1. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
2. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.

3. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

1. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. **Power System Protection & Switchgear,** Ravindarnath & Chandra -New age Publications.
3 **Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE63 ELECTRICAL MACHINE DESIGN

Subject Code	:	**10EE63**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

PRINCIPLES OF ELECTRICAL MACHINE DESIGN: Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.

4 Hours

UNIT - 2

DESIGN OF DC MACHINES: Output equation, choice of specific loadings and choice of number of poles, design of Main dimensions of the DC machines, Design of armature slot dimensions, commutator and brushes, magnetic circuit - estimation of ampere turns, design of yoke and poles- main and inter poles, field windings – shunt, series and inter poles. **10 Hours**

UNIT - 3 & 4

DESIGN OF TRANSFORMERS (Single phase and three phase): Output equation for single phase and three phase transformers, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and conductor cross sectional area of Primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation. Design of tank and cooling tubes (round and rectangular) **12 Hours**

PART - B

UNIT - 5 & 6

DESIGN OF INDUCTION MOTORS: Output equation, Choice of specific loadings, main dimensions of three phase induction motor, Stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, design of Rotor bars and end ring, design of Slip ring induction motor, estimation of No load current and leakage reactance, and circle diagram. 1**4 Hours**

UNIT - 7 & 8
DESIGN OF SYNCHRONOUS MACHINES: Output equation, Choice of specific loadings, short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non salient pole synchronous machines. Design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non-salient pole machine . **12 Hours**

TEXT BOOKS:

1. **A Course In Electrical Machine Design**, A.K.Sawhney,Dhanpatt Rai & Sons
2. **Design Of Electrical Machines**, V. N. Mittle, 4^{th} edition

REFERENCE BOOKS:

1. **Performance And Design Of AC Machine**s, M.G.Say,CBS Publishers and Distributors Pvt.Ltd.
2. **Design Data Handbook,** A.Shanmugasundarm, G,Gangadharan,R.Palani,Wiley Eastern Ltd.

10EE64 DIGITAL SIGNAL PROCESSING

Subject Code	:	**10EE64**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 and 2
Discrete Fourier Transforms: Definitions, properties-linearity, shift, symmetry etc, circular convolution – periodic convolution, use of tabular arrays, circular arrays, stock hams's method, linear convolution – two finite duration sequence, one finite & one infinite duration, overlap add and save methods**.**
14 Hours

UNIT – 3 and 4
FAST FOURIER TRANSFORMS ALGORITHMS: Introduction, decimation in time algorithm, first decomposition, number of computations, continuation of decomposition, number of multiplications, computational efficiency, decimation in frequency algorithms, algorithm, inverse decimation in time and inverse decimation in frequency algorithms, decomposition for a composite number N=9. **12 Hours**
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PART - B

UNIT – 5 AND 6
DESIGN OF IIR DIGITAL FILTERS: Introduction, impulse invariant & bilinear transformations, all pole analog filters- Butterworth & chebyshev, design of digital Butterworth & chebyshev, frequency transformations **12 Hours**

UNIT 7
DESIGN OF FIR DIGITAL FILTERS: Introduction, windowing, rectangular, modified rectangular, Hamming, Hanning, blackman window(excluding Kaiser window), frequency sampling techniques.
`8 Hours

UNIT - 8
REALIZATION OF DIGITAL SYSTEMS: Introduction, block diagrams and SFGs, realization of IIR systems- direct form, cascaded, parallel form, ladder structures for equal degree polynomial, realization of FIR systems – direct form, cascade form, linear pha se realization. **06 Hours**

TEXT BOOKS:

1. **Digital Signal Processing Principle, Algorithm & application**, Proakis, Pearson,4th education, 2009.
2. **Digital Signal Processing ,** Sanjeet. K. Mitra ,TMH,3rd Edition,2009.

REFERENCE BOOKS:

1. **Introduction To Digital Signal Processing**, Johnny R. Johnson,PHI,2009
2. **Discrete Time Signal Processing** ,Openheim, pearson 2nd Edition 2009
3. **Digital Signal Processing,** S.Salivahanan,A. Vallaraj,C.Gnanapriya,TMH,2nd Edition,2010.
4. **Digital Signal Processing**, Ifeachor Emmauel- Pearson education,2nd Edition,2006.
5. **Fundamentals of Digital Signal Processing,**Ludeman,John Wiley, 3rd Edition,2008

10EE65 CAED (COMPUTER AIDED ELECTRICAL DRAWING)

Subject Code	:	**10EE65**	**IA Marks**	:	25
No. of Lecture and Practice Hrs./ Week	:	01Hour Lecture + 03 Hours Practical	Exam Hours	:	03
Total No. of Lecture and Practice Hrs.	:	52	Exam Marks	:	100

PART - A

1. Winding Diagrams

(a) Developed winding diagrams of D.C. machines – Simpl ex and multiplex double layer Lap and Wave windings.
(b) Developed winding diagrams of A.C. machines
  (i) Integral and Fractional slot double layer Lap and Wave windings.
  (ii) Single layer windings – Un-bifurcated 2 and 3 tier windings, mush windings, Bifurcated 2 and 3 tier windings.

2. Single line diagrams of generating stations and substations. **20 Hours**

PART - B

3. Electrical machine assembly drawing using designs data or sketches or both.

(a) Transformers - sectional views of single and three phase core and shell type transformers.
(b) D.C. machine - sectional views of yoke, field system, armature and commutator dealt Separately.
(c) Alternator – sectional views of stator and rotor dealt separately. **32 Hours**

TEXT BOOKS:

1. **Performance & Design of Alternating Current machines**, M. G. Say, CBS publishers,3rd Edition,2002.
2. **The Performance & Design of DC machines** A.E Clayton & N.N.Hancock CBS Publication,3rd Edition,2004.

REFERENCE BOOKS:

1. **Manuals of Auto - CAD**

Elective-I (Group A)

10EE661 OPERATION RESEARCH

Subject Code	:	**10EE661**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

Unit – 1
Linear Programming, Introduction, formulation of linear programming problem, Standard and matrix from, graphical solution, simplex method, computational procedure, Big-M method, Two-phase simplex method. **8 Hours**

Unit – 2
Special cases, Degeneracy, alternative optimal solutions, unbounded solutions, Non-existing optimal solutions. Duality in LPP, primal-dual relation, Formulation of dual problem, primal-dual optimal solution, limitations of LPP. 8 **Hours**

Unit – 3
ADVANCED LINEAR PROGRAMMING: Revised simplex method,dual simplex method,parametric programming. **5 Hours**

Unit – 4
Assignment problems, Introduction, Formulation, Hungarian method of solving assignment problem, special cases, Traveling salesman problem. **5 Hours**

PART – B

Unit – 5
TRANSPORTATION PROBLEMS: Basic feasible solution by different methods, fixing optimal solutions-stepping stone methode, MODI method, degenerasity. **7 Hours**
Unit – 6
GAMES THEORY: Introduction to optimal strategies, solution of 2 x 2, 2 x n, m x 2 games. Concept of dominance, Graphical method of solving. Sequencing problems, n-jobs and one machine. Heuristic problem solving (Continued) n-jobs and two machines, n-jobs and three machines, two jobs and m machines. N-jobs and m-machines. **7 Hours**

Unit – 7
PERT-CPM TECHNICS: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic modes, prediction of date of completion, crashing of a simple networks, resource leveling by network techniques. 6 **Hours**

Unit – 8: Replacement theory, Introduction, Economic life of equipments, Replacement considering both the cases with and without tie value of money, group replacement policy. **6 Hours**

TEXT BOOK:

1.**Fundamentals of operations research** – Ackoff, R.L. and Sasieni, M.W. Wiley eastern limi ted, New Delhi.
2.**Opretions Research Applications and Algorithms,** Wayne L. Winston,Cengage Learning,4th Edition,2009.
3.**Operations Research** – Bronson, R- Schaum's outline series, Mc Graw Hil l International, 2nd Edition.
4.**Introduction to operations Research**,Gillet, B.e., TMH,1979.
5. **Introduction to operations Research** – Hillier, F.S. and Lieberman, G.J, TMH, 8 th Edition, 2009

6. **Operational Research,** S.D sharma

10EE662 ADVANCED POWER ELECTRONICS

Subject Code	:	**10EE662**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2
DC-DC SWITCHED MODE CONVERTERS: Topologies, Buck, boost, buck-boost, and Cuk converters, Full Bridge DC-DC converter-detailed theory, working principles, modes of operation, with detailed circuits and wave forms, applications, merits and demerits. **16 Hours**

UNIT - 3 & 4
DC-AC SWITCHED MODE INVERTERS: Single-phase inverters, three phase inverters. SPWM inverter, detailed theory, working principles, modes of operation with circuit analysis, applications, merits and demerits, problems based on input output voltage relationship.

10 Hours

PART - B

UNIT - 5
RESONANT CONVERTERS: Zero voltage and zero current switching, resonant switch converters, and comparison with hard switching, switching locus diagrams, and working principle. **8 Hours**

UNIT - 6
HIGH FREQUENCY INDUCTOR AND TRANSFORMERS: Design principles, definitions, comparison with conventional design and problems. Design of Flyback transformer.
08 Hours

UNIT - 7 & 8

POWER SUPPLIES: Introduction, DC power supplies: fly back converter, forward converter, push-pull converter, half bridge converter, full bridge converter, AC power supplies: switched mode ac power supplies, resonant ac power supplies, bidirectional ac power supplies. **10 Hours**

TEXT BOOKS:

1. **Power Electronics**, Daniel.W.Hart, TMH, First Edition,2010.
2. **Power Electronics - converters, application & design**, Mohan N, Undeland T.M., Robins, W.P,John Wiley ,3rd Edition 2008
3. **Power Electronics-Circuits, Devices, Applications,** Rashid M.H., PHI, 3rd Edition, 2008.

REFERANCE BOOKS:

1.**Power Electronics Essentials and Applications**,L.Umanand, Wiely India Pvt Ltd,Reprint,2010
2.**Modern Power Electronics and A.C. Drives,** Bose B.K, PHI, 2009.
3. **Digital Power Electronics And Applications,** Muhammad Rashid, Elsevier , first edition, 2005.
4. **Power Electronics,Devices,Circuits and Industrial Applications**,V.R.Moorthi,Oxford,7th impression,2009.

10EE663 FUZZY LOGIC

Subject Code	:	**10EE663**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
THE MATHEMATICS OF FUZZY CONTROL: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle. **8 Hours**

UNIT - 2, 3 and 4
THEORY OF APPROXIMATE REASONING: Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference.
NON-LINEAR FUZZY CONTROL: FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC. **18 Hours**

PART - B

UNIT - 5 and 6
FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, aircraft landing Control etc).
14 Hours

UNIT - 7 and 8
ADAPTIVE FUZZY CONTROL: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller. **12 Hours**
TEXT BOOKS:

1. **Fuzzy Logic With Engineering Applications-** Timoty Ross,John Wiley, Second Edition, 2009.
2. **Fuzzy Sets Uncertainty and Information**- G. J. Klir and T. A. Folger, PHI IEEE, 2009.

REFERENCE BOOKS:

1. **An Introduction to Fuzzy Control**, D. Diankar, H. Hellendoom and M. Reinfrank ,Narosa Publishers India, 1996.
2. **Essentials of Fuzzy Modeling and Control**, R. R. Yaser and D. P. Filer,John Wiley, 2007.
3. **Fuzzy Logic Intelligence Control And Information,** Yen- Pearson education,First Edition,2006.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	**10EE664**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Out put, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Cl ass, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

1. **Object Oriented Programming with C++**- Balagurusamy, E, TMH,4th edition, 2008.
2. **C++, The Complete Reference -**Herbert Schildt, , TMH, 4th edition
3. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

1. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE665 EMBEDDED SYSTEMS

Subject Code	:	**10EE665**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

CONCEPT OF EMBEDDED SYSTEM DESIGN: Components, classification, skills required.Embedded Micro controller cores: Architecture of 6808 and 6811.Embedded Memories ROM variants, RAM.Applications of embedded system: Examples of Embedded systems SOC for cellless bar code scanner. **10 Hours**

UNIT - 3

TECHNOLOGICAL ASPECTS OF EMBEDDED SYSTEM: Interfacing between analog and digital blocks, Signal conditioning, digital signal processing, DAC & ADC interfacing, Sample & hold, multiplexer interface Internal ADC interfacing (excluding 6805 & 6812), Data Acquisition System and Signal conditioning using DSP. **10 Hours**

UNIT - 4

DESIGN TRADE OFFS DUE TO PROCESS INCOMPATIBILITY, THERMAL CONSIDERATIONS: Issues in embedded system design. Design challenge, design technology, trade offs. Thermal considerations. **6Hours**

PART - B

UNIT - 5 & 6

Software aspects of Embedded Systems, real time programming Languages, operating systems. Programming concepts and embedded programming in C.Round Robin, Round Robin with interrupts, function queue-scheduling architecture, Real time OS architecture, selecting architecture. Introduction to RTOS. **12 Hours**

UNIT - 7 & 8

Subsystem interfacing with external systems user interfacing, Serial I/O devices, Parallel port interfaces: Input switches, Key boards and Memory interfacing.

Case study: Embedded velocity PID controller, PI controller with a PWM actuator. **14Hours**

TEXT BOOKS:

1. **Embedded Microcomputer systems: Real time interfacing-** Valvano, J.W, Cengage Learning,2nd Edition 5th Indian reprint,2009
2. **The Art of Designing Embedded systems**- Ganssle, Jack, Newness

3. **Embedded System, Architecture, Programming and Design-** Raj Kamal ,TMH,2nd Edition 2008.

REFERENCE BOOKS:

1. **A Unified Hardware/Software Introduction-**Frank Vahid/Tony Givargis, Wiley student edition 2002
2. **Motorola and Intel Manuals**
3. **Embeded Software Premier,**Simon David, Addison Wessly 2000.

10EE666 ELECTRICAL ENGINEERING MATERIALS

Subject Code	:	**10EE666**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
CONDUCTING MATERIALS: Review of metallic conduction on the basis of free electron theory. Fermi-Dirac distribution – variation of conductivit y with temperature and composition, materials for electric resistors- general electric properties; material for brushes of electrical machines, lamp filaments, fuses and solder. **6 Hours**

UNIT - 2
SEMICONDUCTORS: Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors.
Magnetic materials: Classification of magnetic materials- origin of permanent magnetic dipoles, ferromagnetism, hard and soft magnetic materials, magneto materials used in electrical machines, instruments and relays. **10 Hours**

UNIT - 3 & 4
DIELECTRICS: Dielectric, polarization under static fields- electronic ionic and dipolar polarizations, behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials. Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss.
INSULATING MATERIALS: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bakelite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators. **10 Hours**

PART - B

UNIT - 5
MATERIALS FOR SPECIAL APPLICATIONS: Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts. **6 Hours**

UNIT - 6
MODERN TECHNIQUES FOR MATERIALS STUDIES: Optical microscopy, Electron microscopy, Photo electron spectroscopy, Atomic absorption spectroscopy, magnetic resonance, nuclear magnetic resonance, electron spin resonance and ferromagnetic resonance. **6 Hours**

UNIT - 7
Introduction Properties and Application of Piezoelectric materials, Eletrostrictive materials, Ferromagnetic materials, Magnetostrictive materials, Shape memory alloys, Electro archeological fluids, Magneto archeological fluids, Smart hydrogels. **6 Hours**

UNIT - 8
Ceramics: properties, application to conductors, insulators & capacitors
Plastics: Thermoplastics, rubber, thermostats, properties.

8Hours

TEXT BOOKS:

1. **An Introduction to Electrical Engineering-** Indulkar C.S. & Thiruvengadam. S,Chand publishers.
2. **Materials Science for Electrical and Electronic Engineers,** Ian P. Jones, Oxford University Press,Indian Edition, 2007.
3. **Electrical Engineering Materials,**Kapoor P L., Khanna Publications.
4. **Renewable Energy Sources and Emerging Technologies,** D.P. Kothari, K.C. Singal, Rakesh Ranjan. PHI, 2008.

REFERENCES:

1. **Electrical Properties of Materials**, L.Solymar, D.Walsh, 8th Indian Edition- Oxford University Press Seventh Edition.
2. **MEMS and MOEMS Technology and Applications,** P.Rai-Choudhury (Editor), PHI,2009 .
3. **Introduction to Electronic Properties and Materials,**David Jiles,CRC Press,2nd Ediyion.

10EEL 67 DC MACHINES AND SYNCHRONOUS MACHINES LABORATORY

Subject Code	:	**10EEL67**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Load characteristics of a D.C. shunt and compound generator - i) Short shunt-Cumulative and Differential (ii) Long shunt-Cumulative and Differential.
2. Load test on a DC motor- determination of speed-torque and HP-efficiency characteristics.
3. Swinburne's Test.
4. Hopkinson's Test.
5. Field's test on series motors.
6. Retardation test- electrical braking method.
7. Speed control of DC motor by armature voltage control and flux control.
8. Ward Leonard method of speed control of D.C. motor.
9. Voltage regulation of an alternator by EMF and MMF method.
10. Voltage regulation of an alternator by ZPF method.
11. Slip test and determination of regulation.
12. Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.
13. V and Inverted V curves of a synchronous motor.
14. Measurement of X_1, X_2 and X_o of a Synchronous generator and calculation of currents for an LG,LL or LLG fault.

10EEL68 CONTROL SYSTEMS LABORATORY

Subject Code	:	**10EEL68**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Using MATLAB/SCILAB a) Simulation of a typical second order system and determination of step response and evaluation of time- domain specifications

b) Evaluation of the effect of additional poles and zeroes on time response of second order system
c) Evaluation of effect of pole location on stability
d) Effect of loop gain of a negative feedback system on stability

2. (a) To design a passive RC lead compensating network for the given specifications, viz., the maximum phase lead and the frequency at which it occurs and to obtain its frequency response.
   (b) To determine experimentally the transfer function of the lead compensating network.
3. (a) To design RC lag compensating network for the given specifications., viz., the maximum phase lag and the frequency at which it occurs, and to obtain its frequency response.
   (b) To determine experimentally the transfer function of the lag compensating network.
4. Experiment to draw the frequency response characteristic of a given lag- lead compensating network.
5. To study the effect of P, PI, PD and PID controller on the step response of a feedback control system (using control engineering trainer/process control simulator). Verify the same by simulation.
6. a) Experiment to draw the speed – torque characteri stic of a two - phase A.C. servomotor.
   b) Experiment to draw speed torque characteristic of a D.C. servomotor.
7. To determine experimentally the frequency response of a second -order system and evaluation of frequency domain specifications.
8. Using MATLAB/SCILAB

   a) Simulate a D. C. position control system and obtain its step response

   b) To verify the effect of the input wave form, loop gain system type on steady state errors.

   c) To perform a trade-off study for lead compensation

   d) To design a PI controller and study its effect on steady state error

9. Using MATLAB/SCILAB

   a) To examine the relationships between open-loop frequency response and stability , open loop frequency and closed loop transient response
   b) To study the effect of addition closed loop poles and zeroes on the closed loop transient response

10. Using MATLAB/SCILAB

    a) Effect of open loop and zeroes on root locus contour
    b) To estimate the effect of open loop gain on the transient response of closed loop system by using Root locus
    c) Comparative study of Bode, Nyquist and Root locus with respect to Stability.

11. Experiment to draw to syncro pair characteristics.

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10EE71 COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject Code	:	10EE71	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
NETWORK TOPOLOGY: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices – Element -node, Bus incidence, Tree-branch path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop, Primitive network – impedance form and admittance form. **6 Hours**

UNIT - 2
NETWORK MATRICES: Introduction, Formation of Y_{BUS} by method of inspection (including transformer off-nominal tap setting) and method of singular transformation ($Y_{BUS} = A^T yA$), Formation of Bus Impedance matrix by step by step building algorithm (without mutual coupling elements). **6 Hours**

UNIT - 3 & 4
LOAD FLOW STUDIES: Introduction, Power flow equations, Classification of buses, Operating constraints, Data for load flow, Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson's Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only). Algorithm for Fast Decoupled load flow method, Comparison of Load Flow Methods. **14 Hours**

PART - B

UNIT - 5 & 6
ECONOMIC OPERATION OF POWER SYSTEM: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling including generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative tech nique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm. **12 Hours**
UNIT - 7 & 8
TRANSIENT STABILITY STUDIES: Numerical solution of Swing Equation – Point-by-po int method, Modified Euler's method, Runge-Kutta method, Milne' s predictor corrector method. Representation of power system for transient stability studies – load representation, network performance equations. Solution techniques with flow charts. **14 Hours**

TEXT BOOKS:

1. **Computer Methods in Power System Analysis,** Stag, G. W., and EI-Abiad, A. H.- McGraw Hill International Student Edition. 1968
2. **Computer Techniques in Power System Analysis**, Pai, M. A- TMH, 2nd edition, 2006.

REFERENCE BOOKS:

1. **Modern Power System Analysis,** Nagrath, I. J., and Kothari, D. P, TMH,3rd Edition, 2003.
2. **Advanced Power System Analysis and Dynamics**, Singh, L. P, New Age International (P) Ltd, New Delhi, 2001.
3. **Computer Aided Power System Operations and Analysis**"- Dhar, R. N, TMH, 1984.
4. **Power System Analysis,** Haadi Sadat, TMH, 2nd Edition, 12th reprint, 2007

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.

3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	**10EE73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.
6Hours

UNIT - 2 & 3
BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in n on uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its signi ficance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4
GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5
GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6
MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2^{nd} Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2^{nd} Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE74 INDUSTRIAL DRIVES & APPLICATIONS

Subject Code	:	**10EE74**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

AN INTRODUCTION TO ELECTRICAL DRIVES & ITS DYNAMICS: Electrical drives. Advantages of electrical drives. Parts of electrical drives, choice of electrical drives, status of dc and ac drives, Dynamics of electrical drives, Fundamental torque equation, speed torque conventions and multiquadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization. **9 Hours**

UNIT - 2

SELECTION OF MOTOR POWER RATING: Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating. **5 Hours**

UNIT - 3 & 4

D C MOTOR DRIVES:

(a) Starting braking, transient analysis, single phase fully controlled rectifier, control of separately excited dc motor, Single-phase half controlled rectifier control of separately excited dc motor.

(b) Three phase fully controlled rectifier - control of separately excited dc motor, three phase half controlled rectifier - control of separately excited dc motor, multi-quadrant operation of separately excited dc motor fed from fully controlled rectifier. Control of dc series motor, chopper controlled dc drives-separately excited dc motor and series motor. **12 Hours**

PART - B

UNIT - 5

INDUCTION MOTOR DRIVES:

Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.

06 Hours

UNIT - 6

Stator voltage control:

Variable voltage and variable frequency control, voltage source inverter control, closed loop control, current source inverter control, , rotor resistance control, slip power recovery, speed control of single phase induction motors. **06 Hours**

UNIT - 7

SYNCHRONOUS MOTOR DRIVES: Operation from fixed frequency supply, synchronous motor variable speed drives, variable frequency control of multiple synchronous motors. Self-controlled synchronous motor drive employing load commutated thyrister inverter. **10 Hours**

UNIT - 8

INDUSTRIAL DRIVES: Rolling mill drives, cement mill drives, paper mill drives and textile mill drives.

4 Hours

TEXT BOOK:

1. **Fundamentals of Electrical Drives**, G.K Dubey , Narosa publishing house, 2nd Edition,2002.

REFERENCE BOOKS:

1. **Electrical Drives**, N.K De and P.K. Sen- PHI, 2009.
2. **A First Course On Electric Drives**, S.K Pillai-Wiley Eastern Ltd 1990.
3. **Power Electronics, Devices, Circuits and Industrial Applications**, V.R. Moorthi, "Oxford University Press, 2005.
4. **Electric Motor Drives,Modeling,Analysis and Control**, R.Krishnan,PHI,2008.

ELECTIVES-II(GROUP **B)**

10EE751 HVDC TRANSMISSION

Subject Code	:	**10EE751**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

GENERAL ASPECTS OF DC TRANSMISSION AND COMPARISON OF IT WITH AC TRANSMISSION: Historical sketch, constitution of EHV AC and DC links, Limitations and Advantages of AC and DC Transmission**. 12 Hours**

UNIT - 3 & 4

CONVERTER CIRCUITS: Valve Characteristics, Properties of converter circuits, assumptions, single phase, three phase converters, choice of best circuits for HV DC circuits. **12 Hours**

PART - B

UNIT - 5

ANALYSIS OF THE BRIDGE CONVERTER: Analysis with grid control but no over lap, Analysis with grid control and with over lap less than 60 deg, Analysis with overlap greater than 60 deg, complete characteristics of rectifier, Inversion. **10 Hours**

UNIT - 6 & 7

CONTROL OF HVDC CONVERTERS AND SYSTEMS: grid control, basic means of control, power reversal, limitations of manual control, constant current versus constant voltage, desired feature of control, actual control characteristics, constant -minimum -Ignition –angle control, constant –current control, constant –extinction –angle control, stability of c ontrol. **10 Hours**

UNIT - 8

PROTECTION: Introduction, DC reactor, voltage oscillations and valve dampers, current oscillations and anode dampers, DC line oscillations and line dampers, clear line faults and reenergizing the line. **8 Hours**

TEXT BOOKS:

1. **Direct current Transmission,** EW Kimbark,
2. **Power system stability and control,** Prabha Kundur, TMH, 9th reprint, 2007.
3. **High Voltage Power Transmission:The HVDC Options,** Jos Arrillaga, Y.H.Liu and Mevelle R Watson, Wiley Interscience.
4. **High Voltage D.C.Power Transmission System,** K.R.Padiyar,New Age International Publishers Ltd.

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2
ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches **8 Hours**

UNIT - 3 & 4
PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**. 10 Hours**

PART - B

UNIT - 5
INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**
UNIT - 6 & 7
Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**
UNIT - 8
Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**
Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:
1. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications"-** John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:
1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE753 ARTIFICIAL NEURAL NETWORK

Subject Code	:	10EE753	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks. **7 Hours**

UNIT - 2
Supervised learning, single layer networks, perceptrons, linear separability, perceptron training algorithm, guarantees of success, modifications. **6 Hours**

UNIT - 3
Multiclass networks-I, multilevel discrimination, back propagation, setting parameter values, theoretical results. **6 Hours**

UNIT - 4
Accelerating learning process, application, Madaline adaptive multilayer networks. **7 Hours**

PART - B

UNIT - 5
Prediction networks, radial basis functions, polynomial networks, regularization, unsupervised learning, winner-take-all networks. **7 Hours**

UNIT - 6
Learning vector quantizing, counter propagation networks, adaptive resonance theorem, toplogically organized networks, distance based learning, recognition. **6 Hours**

UNIT - 7
Associative models, Hop Field networks, brain state networks, Boltzmann machines, hetero associations.
7 Hours

UNIT - 8
Optimization using Hopfiled networks, simulated annealing, random search, evolutionary computation.
6 Hours

TEXT BOOKS:
1. **Elements Of Artificial Neural Networks -**Kishan Mehrotra, C. K. Mohan, Sanjay Ranka, Penram, 1997
2. **Artificial Neural Networks**- R, Schalkoff, McGraw Hill, 1997.

REFERENCE BOOKS:
1.Neural Network Design- Hagan, Demuth and Beale Cengage,2nd Edition

2.Introduction To Artificial Neural Systems- J. Zurada, Jaico, 2003
3.Neural Networks -Haykins, PHI, 1999.
4. Artificial Neural Networks, B. Yegnanarayana ,PHI,2009 Edition.

10EE754 OPERATING SYSTEM

Subject Code	:	**10EE754**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART- A

UNIT – 1

INTRODUCTION TO OPERATING SYSTEM, SYSTEM STRUCTURES: What operating system do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **6 Hours**

UNIT - 2

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling. **7 Hours**

UNIT - 3

PROCESS SYNCHRONIZATION: Synchronization: The Critical section problem; Peterson’s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **7 Hours**

UNIT - 4

DEADLOCKS: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **6 Hours**

PART – B

UNIT - 5

MEMORY MANAGEMENT: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.**7 Hours**

UNIT - 6

FILE SYSTEM, IMPLEMENTATION OF FILE SYSTEM: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **7 Hours**

UNIT - 7

SECONDARY STORAGE STRUCTURES, PROTECTION: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems. **6 Hours**

UNIT - 8

CASE STUDY: THE LINUX OPERATING SYSTEM: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication. **6 Hours**

TEXT BOOK:

1. **Operating System Principles –** Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley, 8th Edition, 2009.

REFERENCE BOOKS:

1. **Operating Systems: A Concept Based Approach** – D.M Dhamdhere, TMH, 2 nd Edition,2006.
2. **Operating Systems,** P.C.P. Bhatt, PHI, 2nd Edition, 2008.
3. **Operating Systems,**Harvey M Deital,Pearson Education, 3rd Edition.

10EE755 DIGITAL SYSTEM DESIGN WITH VHDL

Subject Code	:	**10EE755**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter. **10 Hours**

UNIT - 2

DESIGNING WITH PROGRAMMABLE LOGIC DEVICES: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PALs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner. **5 Hours**

UNIT - 3

DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider. **5 Hours**

UNIT - 4

DIGITAL DESIGN WITH SM CHARTS: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines. **6 Hours**

PART - B

UNIT - 5

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 series FPGAs, Designing with FPGAs, Xilinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs.

6 Hours

UNIT - 6

FLOATING-POINT ARITHMETIC: Representation of floating-point numbers, Floating-point multiplication, Other floating-point operations. **6 Hours**

UNIT - 7

ADDITIONAL TOPICS IN VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multivalued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and TEXTIO. **7 Hours**

UNIT - 8
VHDL MODELS FOR MEMORIES AND BUSES: Static RAM, A simplified 486 bus model, interfacing memory to a microprocessor bus. **7 Hours**
TEXT BOOKS:

1. **Digital Systems Design Using VHDL,**Charles H. Roth. Jr, Cengage, 2010.
2. **Digital Electronics And Design With VHDL,** A. Pedroni, Volnet, Elsevier, 1st edition, 2008

REFERENCE BOOKS:

1. **Fundamentals of Digital Logic with VHDL Design,**Stephen Brwon & Zvonko Vranesic, TMH,2nd Edition 2006
2. **Digital Fundamentals using VHDL,**Floyd, Pearson Education, 2003,
3. **VHDL Primer**, J. Bhaskar , PHI, 2009.

10EE756 TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENT

Subject Code	:	**10EE756**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2
TRANSFORMERS:
a. Specifications: Power and distribution transformers as per BIS standards.

b. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

5 Hours

c. Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz & other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test.

7 Hours

d. Specific Tests: Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal &abnormal conditions.

3 Hours

UNIT - 3 & 4
SYNCHRONOUS MACHINES:
a. Specifications: As per BIS standards.

b. Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

c. Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

4 Hours

d. Performance tests: Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient & sub transient parameters, measurements of sequence impedances, capacitive reactance, and separation of losses, temperature rise test, and retardation tests.

6 Hours

e. Factory tests: Gap length, magnetic eccentricity, balancing vibrations, bearing performance.

2 Hours

PART - B

UNIT - 5, 6 & 7
INDUCTION MOTORS:
a. **Specifications** for different types of motors, Duty, I.P. protection.

2 Hours

b. Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of windings.

4 Hours

c. Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing.

5 Hours

Electrical Tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test, factory test and site test (in accordance with ISI code

4 Hours

d. Specific Tests: Performance & temperature raise tests, stray load losses, shaft alignment, and re-rating & special duty capability.

4 Hours

UNIT - 8
SWITCH GEAR & PROTECTIVE DEVICES: Standards, types, specification, installation, commissioning tests, maintenance schedule, type & routine tests.

6 Hours

TEXT BOOKS:

1. **Testing & Commissioning Of Electrical Equipment -**S. Rao,Khanna Publishers,2004
2. **Testing & Commissioning Of Electrical Equipment** -B .V. S. Rao, Media Promoters and Publication Pvt., Ltd.

REFERENCE BOOKS:

1. **Relevant Bureau of Indian Standards**
2. **A Handbook on Operation and Maintenance of Transformers-** H. N. S. Gowda, Published by H. N. S. Gowda,2006
3. **Handbook of SwitchGears,**BHEL, TMH,2005.
4 **J and P Transformer Book**,Elsevier Publication.

ELECTIVES-II (GROUP **C)**

10EE761 POWER SYSTEMPLANNING

Subject Code	:	**10EE761**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION OF POWER PLANNING, National and regional planning, structure of power system, planning tools, electricity regulation, Load forecasting, forecasting techniques, modeling. **8 Hours**

UNIT - 2 & 3
GENERATION PLANNING, Integrated power generation, co-generation / captive power, power pooling and power trading, transmission & distribution planning, power system economics, power sector finance, financial planning, private participation, rural electrification investment, concept of rational tariffs.
10 Hours

UNIT - 4
COMPUTER AIDED PLANNING: Wheeling, environmental effects, green house effect, technological impacts, insulation co-ordination, reactive compensation. **8 Hours**

PART - B

UNIT - 5 & 6
POWER SUPPLY RELIABILITY, reliability planning, system operation planning, load management, load prediction, reactive power balance, online power flow studies, test estimation, computerized management. Power system simulator**. 10 Hours**

UNIT - 7 & 8
Optimal Power system expansion planning, formulation of least cost optimization problem incorporating the capital, operating and maintenance cost of candidate plants of different types (thermal hydro nuclear non conventional etc), Optimization techniques for solution by programming. **16 Hours**

TEXT BOOK:
1. **Electrical Power System Planning,** A.S.Pabla, Macmillan India Ltd, 1998

10EE762 COMPUTER CONTROL OF ELECTRICAL DRIVES

Subject Code	:	**10EE762**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
REVIEW OF MICRO CONTROLLERS IN INDUSTRIAL DRIVES SYSTEM: Typical Micro controller's 8 bit 16 bit (only block diagram) Digital Data Acquisition system, voltage sensors, current sensors, frequency sensors and speed sensors. **4 Hours**

UNIT - 2
EVOLUTION OF POWER ELECTRONICS IN DRIVES: Power semiconductors devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications. Block diagram of power integrated circuit for D C motor drives. **4Hours**

UNIT - 3
A C MACHINE DRIVES: general classification and National Electrical Manufacturer Association (NEMA) classification, Speed control of Induction motors with variable voltage constant frequency, constant voltage variable frequency, (v/f) constant operation, drive operating regions. Variable stator current operation. Effect of Harmonics. **9 Hours**
UNIT - 4
SYNCHRONOUS MACHINE DRIVES: Wound field machine, comparison of Induction and wound field synchronous machines, Torque angle characteristics of salient pole synchronous machines, synchronous reluctance permanent magnet synchronous machines (SPM), variable reluctance machines (VRM).
8 Hours

PART - B

UNIT - 5
PHASE CONTROLLED CONVERTERS: Converter controls, Linear firing angle control, cosine wave crossing control, phase locked Oscillator principle, Electrro magnetic Interference (EMI) and line power quality problems, cyclo converters, voltage fed converters, Rectifiers, Current fed converters.
7 Hours
UNIT - 6
PRINCIPLES OF SLIP POWER RECOVERY SCHEMES: Static Kramer's drive system, block schematic diagram, phasor diagram and limitations, Static Scherbins scheme system using D.C link converters with cyclo converter modes of operation, modified Scherbins Drive for variable source, constant frequency (VSCF) generation. **6 Hours**

UNIT - 7
PRINCIPLE OF VECTOR CONTROL OF A C DRIVES: Phasor diagram, digital Implementation block diagram, Flux vector estimation, indirect vector control block diagram with open loop flux control, synchronous motor control with compensation. **6 Hours**

UNIT - 8
EXPERT SYSTEM APPLICATION TO DRIVES (ONLY BLOCK DIAGRAM): Expert system shell, Design methodology, ES based P-I tuning of vector controlled drives system, Fuzzy logic control for speed controller in vector control drives,structure of fuzzy control in feedback system. **8 Hours**

TEXT BOOKS:

1. **Power Electronics & Motor Drives,**Bimal Bose, Elsevier 2006

2. **Modern Power Electronics & Drives,**Bimal K. Bose, Pearson Education 2003.

REFERENCE BOOK:

1. **Advanced Microprocessor and Interfacing,** Badri Ram, TMH, 1^{st} Edition.

10EE763 DATA STRUCTURES

Subject Code	:	**10EE763**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

UNIT – 1

Design and Analysis of Algorithms: From problems to programs, Data Structures and Abstract Data types. **04 Hours**

UNIT – 2

Basic Data Type and Trees: Data types List, Implementation of lists, stacks Queues, Mappings, Stacks and recursive procedures. Basic terminology, ADT Tree, / Implementation of trees, Binary trees. **10 Hours**

UNIT – 3

Basic Operation on Sets: Introduction to sets an ADT with union intersection and difference, A Bit-vector implantation sets, A linked list implementation sets, The dictionary, simple dictionary implementation, the Hash table data structures, Estimating the efficiency of functions, Implementation of the mapping ADT, Priority Queues, Implementation of priority queues. **06 Hours**

UNIT – 4

Directed Graphs: Basic Definitions, Representation for directed graphs, the single source short path problems, Traversals of Directed Graphs, Directed A cyclic graphs, strong components. **06 Hours**

PART B

UNIT – 5

Sorting: The internal sorting model, simple sorting schemes, Quick sort Heapsort, Binsorting. **06 Hours**.

UNIT – 6

Algorithm analysis Techniques: Efficiency of algorithms, analysis of receive programs solving Recurrence Equations, A general solution for a large class of Recurrences. **06 Hours**

UNIT – 7

Algorithm Design Techniques: Divide and conquer algorithms, Dynamic programming, Greedy Algorithms, Back tracking, local search algorithms. **08 Hours**.

UNIT – 8

Data structures and Algorithm for external storage: A model of external computation, External sorting, sorting information in files, external search Trees. **08 Hours**

Text Book:

1.Data Structures and Algorithms, Alfred Aho, John E. Hopcroft and Jeffery D Ullaman, Pearson Education.

Reference Books:

1. **Introduction to Data structures and Algorithms with C+** by Gleen. W.Rowe, PHI Publications.
2. **Data structures using C & C++,** Langsam, Angenstein, Tenenbaum ,Pearson, 2^{nd} edition,.
3. **Data Structures and Algorithm Analysis in C,** Weiss Mark Allen, Pearson Education,2^{nd} Edition.

10EE764 VLSI CIRCUITS AND DESIGN

Subject Code	:	10EE764	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

A REVIEW OF MICROELECTRONICS AND AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to integrated circuit technology. Introduction, VLSI technologies, MOS transistors, fabrication, thermal aspects, production of E-beam masks. **6 Hours**

UNIT - 2

BASIC ELECTRICAL PROPERTIES OF MOS AND BICMOS CIRCUIT: Drain to source current I_{ds} versus V_{ds} relationships-BICMOS latch up susceptibility. MOS transistor characteristics, figure of merit, pass transistor NMOS and COMS inverters, circuit model, latch up in CMOS circuits. **8 Hours**

UNIT - 3

MOS AND BICMOS CIRCUIT DESIGN PROCESSES: MOS layers, stick diagrams, design, symbolic diagrams. **8 Hours**

UNIT - 4

BASIC CIRCUIT CONCEPTS: Sheet resistance, capacitance layer inverter delays, wiring capacitance, choice of layers. **6 Hours**

PART - B

UNIT - 5

SCALING OF MOS CIRCUITS: Scaling model and scaling factors- Limitations due to current density. **8 Hours**

UNIT - 6

SUBSYSTEM DESIGN AND LAYOUT: Architectural issues, systems considerations. Examples of structural design, clocked sequential circuits. **8 Hours**

UNIT - 7

SUBSYSTEM DESIGN PROCESSES: General considerations, illustration of design process, observations. **4 Hours**

UNIT - 8

ILLUSTRATION OF THE DESIGN PROCESS: Observation on the design process, Regularity Design of an ALU subsystem. Design of 4-bit adder, implementation of ALU functions. **4 Hours**

TEXT BOOKS:

1. **Basic VLSI Design,** Douglas Pucknell &Eshragian**,** PHI, 3rd Edition, 2009.
2. **Fundamentals of Modern VLSI Devices,**Yuan Taun Tak H Ning Cambridge Press, South Asia Edition 2003,
3. **ModernVLSI Design,** Wayne wolf, Pearson Education Inc. 3rd edition, 2003.
4. **Introduction to CMOS VLSI Design-A Circuits and Systems Perspective,** Neil Weste,Pearson Education.3rd Edition.

10EE765 MICRO AND SMART SYSTEM TECHNOLOGY

Subject Code	:	**10EE765**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO MICRO AND SMART SYSTEMS:
a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.
b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.**5 Hours**
UNIT - 2
MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS:
a) Definitions and salient features of sensors, actuators, and systems.
b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.
c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator
d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin. **8 Hours**
UNIT - 3
MICROMANUFACTURING AND MATERIAL PROCESSING:
a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.
b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.
c) Thick-film processing:
d) Smart material processing:
e) Processing of other materials: ceramics, polymers and metals
f) Emerging trends **7 Hours**
UNIT - 4
MODELING:
a) Scaling issues.
b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.
c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators. **6 Hours**

PART - B

UNIT - 5
COMPUTER-AIDED SIMULATION AND DESIGN:
Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software. **8 Hours**

UNIT - 6
ELECTRONICS, CIRCUITS AND CONTROL:
Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler. **8 Hours**

UNIT - 7

INTEGRATION AND PACKAGING OF MICROELECTRO MECHANICAL SYSTEMS:
Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples. **6 Hours**

UNIT - 8

CASE STUDIES: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

4 Hours

PART - C

UNIT - 9

Mini-projects and class-demonstrations (not for Examination)

9 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)
b) BEL pressure sensor
c) Thermal-cycler for PCR
d) Active control of a cantilever beam

TEXT BOOKS AND A CD-SUPPLEMENT:

1. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Hsu, TMH, 1st Edition.

REFERENCE BOOKS:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

3 **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.

4 **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.

5. **Design and Development Methodologies, Smart Material Systems and MEMS**, V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.

6. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007

10EE766 ELECTROMAGNETIC COMPATIBILITY

Subject Code	:	10EE766	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Designing of electromagnetic compatibility, EMC regulation, typical noise path, and use of network theory, method of noise coupling, miscellaneous noise sources, and method of eliminating interference. **8 Hours**

UNIT - 2 & 3

CABLING: Capacitive coupling, effect of shield on magnetic coupling, mutual inductance calculations, magnetic coupling between shield and inner conductor, shielding to prevent magnetic radiation, shielding a receptor against magnetic fields, shield transfer impedance, experimental data, example of selective shielding, co-axial cable versus shielded twisted pair braided shields, effect of pig tails, ribbon cable, electrically long cables. **10 Hours**

UNIT - 4

GROUNDING: Safety grounds, signal grounds, single point ground systems, hybrid grounds, multipoint ground systems, functional ground layout, practical low frequency grounding, hardware grounds, single ground reference for a circuit amplifier shields, grounding of cable shields, ground loops, low frequency analysis of common mode choke, high frequency analysis of common mode choke, differential amplifiers, shields grounding at high frequencies, guard shields guarded meters. **10 Hours**

PART - B

UNIT - 5

BALANCING AND FILTERING: Balancing, power supply decoupling, decoupling filters, amplifier decoupling driving capacitive loads, high frequency filtering, system bandwidth, and modulation and coding. **8 Hours**

UNIT - 6 & 7

SHIELDING: Near field and far fields, characteristic and wave impedance's shielding effectiveness, absorption loss, reflection loss, composite absorption and reflection loss, summary of shielding equation, shielding with magnetic material, experimental data, apertures, wave guide below cutoff, conductive gaskets, conductive windows, conductive coatings, cavity resonance, brooding of shields. **10 Hours**

UNIT - 8

ELECTROSTATIC DISCHARGE: State generation, human body model, static discharge, and ESD protection in equipment design, software and ESD protection, ESD versus EMC. **6 Hours**

TEXT BOOK:

1. **Noise reduction techniques in electronic systems**, Henry W. Ott, John Wiley, 2nd edition, 1988

3. **Engineering Electromagnetic Compatibility: Principles, Measurements & Technologies,** V. Prasad Kodali, S. Chand & Co. Ltd. Delhi, 2000.

REFERENCE BOOKS:

1. Electromagnetics Explained – A Hand Book For Wir eless/Rf,Emc And High Speed Electronoics.

10EEL77 Relay and High Voltage Laboratory

Subject Code	:	**10EEL77**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

(Total 12 experiments are to be conducted by choosing at least 03 experiments from part A, 02 each from part-B and C and 05 from part-D)

PART - A

1. Over current relay **:**
(a) IDMT non-directional characteristics
(b) Directional features
(c) IDMT directional
2. IDMT characteristics of over voltage or under voltage relay.(solid state or electromechanical type
3. (a) To determine 50% probability flashover voltage for air insulation subjected to impulse voltage.
(b) Generation of standard lightning impulse voltage and to determine efficiency and energy of impulse generator.
Operating characteristics of over voltage or under voltage relay. (Solid state or electromechanical type).
4. Operation of negative sequence relay.
5. Bias characteristics of differential relay.
6. Current-time characteristics of fuse.

PART - B

1. Operating characteristics of microprocessor based (numeric) over –current relay.
2. Operating characteristics of microprocessor based (numeric) distance relay.
3 Operating characteristics of microprocessor based (numeric) over/under voltage relay.

PART - C

1. Generator protection –Merz-Price- protection s cheme.
2. Feeder protection scheme-fault studies.
3. Motor protection scheme-fault studies.

PART - D

1. Spark over characteristics of air insulation subjected to high voltage AC with spark over voltage corrected to STP.
2 Spark over characteristics of air insulation subjected to high voltage AC, with spark over voltage corrected to STP for uniform and non-uniform field configuration.
3 Spark over characteristics of air insulation subjected to high voltage DC
4 Measurement of HVAC and HVDC using standard spheres.
5 Breakdown strength of transformer oil using oil-testing unit.
6. Field mapping using electrolytic tank for any one-model cable/capacitor/transmission line/ Sphere gap models.

10EEL78 Power System Simulation Laboratory

Subject Code	:	10EEL78	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

Power system simulation using MATLAB/ C or C ++ /Sci lab /octave

1. a) Y Bus formation for power systems with and without mutual coupling, by singular transformation and inspection method.
   b) Determination of bus currents, bus power and line flow for a specified system voltage (Bus) Profile
2. Formation of Z-bus(without mutual coupling) using Z-bus building Algorithm .
3. ABCD parameters: Formation for symmetric π/T configuration. Verification of AD-BC=1 Determination of efficiency and regulation
4. Determination of power angle diagrams, reluctance power, excitation, emf and regulation for salient and non-salient pole synchronous machines,.
5. To obtain swing curve and to determine critical clearing time and regulation for a single machine connected to infinity bus through a pair of identical transmission lines under 3-phase fault on one of the lines for variation of inertia constant/line parameters /fault location/clearing time/pre-fault electrical output.
6. Formation of Jacobian for a system not exceeding 4 buses (no PV buses) in polar coordinates
7. Write a program to perform load using Gauss- Seidel method (only p q bus)
8. To determine fault currents and voltages in a single transmission line system with star-delta transformers at a specified location for LG, LLG.
9. Load flow analysis using Gauss Siedel method, NR method, Fast decoupled method for both pq and pv buses.
10. Optimal Generation Scheduling for Thermal power plants.

Note: Questions 1-7: Simulation Experiments using MATLAB/C or C++/Scilab/Octave
Questions 8-10: Use suitable standard software package.

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FINAL SCHEME OF TEACHING & EXAMINATION AND SYLLABUS - DATED 16TH AND 17TH APRIL 2010

VIII SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE81	Electrical Design, Estimating and Costing	E&EE	4	-	3	25	100	125
2	10EE82	Power System Operation and Control	E&EE	4	-	3	25	100	125
3	10EE83X	Elective-IV (Group D)	E&EE	4	-	3	25	100	125
4	10EE84X	Elective-V (Group E)	E&EE	4	-	3	25	100	125
5	10EEP85	Project Work	E&EE	-	6	3	100	100	200
6	10EES86	Seminar (on a latest topic relevant to the branch and independent of the project work)	E&EE	-	3	-	50	-	50
Total				16	09	15	250	500	750

Elective-IV (Group-D)

10EE831 - Reactive Power Management
10EE832 - Flexible A.C. Transmission Systems (FACTS)
10EE833- Advanced Instrumentation System
10EE834 - AI Applications to Power Systems
10EE835 - Data Base Management Systems (DBMS)
10EE836 - Renewable Energy Sources

Elective-V (Group-E)

10EE841 - Power Systems Dynamics and Stability
10EE842 - Energy Auditing & Demand Side management
10EE843 - Data communications and Networking
10EE844 - Electrical Distribution Systems
10EE845 - Insulation Engineering
10EE846 - Intellectual Property Rights
10EE847 - Electrical Power Quality

10EE81 ELECTRICAL DESIGN, ESTIMATING AND COSTING

Subject Code	:	**10EE81**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT: 1
GENERAL PRINCIPLES OF ESTIMATION: Introduction to estimation & costing, Electrical Schedule, Catalogues, Market Survey and source selection, Recording of estimates, Determination of required quantity of material, Labor conditions, Determination of cost material and labour, Contingencies, Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Tender form, General idea about IE rule, Indian Electricity Act and major applicable I.E rules. **6Hours**
UNIT: 2
RESIDENTIAL BUILDING ELECTRIFICATION: General rules guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits, Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram, Selection of type of wiring and rating of wires and cables, Load calculations and selection of size of conductor, Selection of rating of main switch, distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation. **7Hours**

UNIT:3
ELECTRIFICATION OF COMMERCIAL INSTALLATION: Concept of commercial installation, Differentiate between electrification of residential and commercial installation, Fundamental considerations for planning of an electrical installation system for commercial building, Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables,busbar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation, Selection of type wire, wiring system and layout, Sequence to be followed to prepare estimate, Preparation of detailed estimate and costing of commercial installation. **7Hours**

UNIT: 4
SERVICE CONNECTION, INSPECTION AND TESTING OF INSTALLATION: Concept of service connection, Types of service connection and their features, Method of installation of service connection, Estimates of under ground and overhead service connections, Inspection of internal wiring installations, Inspection of new installations, Testing of installations, Testing of wiring installations, Reason for excess recording of energy consumption by energy meter. **6Hours**

PART- B

UNIT: 5
ELECTRICAL INSTALLATION FOR POWER CIRCUITS: Introduction, Important considerations regarding motor installation wiring, Determination of input power, Determination of input current to motors, Determination of rating of cables, determination of rating of fuse, Determination of size of Condit, distribution Board main switch and starter**. 6Hours**

UNIT:6 and 7

DESIGN AND ESTIMATION OF OVERHEAD TRANSMISSION & DISTRIBUTION LINES:
Introduction, Typical AC electrical power system, Main components of overhead lines, Line supports, Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers, Muffs, Points to be considered at the time of erection of overhead lines, Erection of supports, Setting of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor , Dead end clamps, Positioning of conductors and attachment to insulators, Jumpers, Tee-offs, Earthing of transmission lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between conductors, Testing and commissioning of overhead distribution lines, Some important specifications. **12Hours**

UNIT: 8

DESIGN AND ESTIMATION OF SUBSTATIONS: Introduction, Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram, Key diagram of typical substations, Equipment for substation and switchgear installations, Substation auxiliaries supply, Substation Earthing **6Hours**

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TEXT BOOK:

1. **Electrical Installation Estimating & Costing,**J.B.Gupta,VIII Edition S.K. Katria & Sons New Delhi

REFERENCE BOOKS :

1. **Electrical Design Estimating and Costing,** K.B.Raina S.K.Bhattacharya, New Age International
2. **Electrical Wiring Estimating and Costing,** Uppal, Khanna Publishers Delhi
3. **I.E.Rules and Act Manuals**

10EE82 POWER SYSTEM OPERATION AND CONTROL

Subject Code	:	**10EE82**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CONTROL CENTER OPERATION OF POWER SYSTEMS:
Power system control and operating states, control center, digital computer configuration, automatic generation control, area control error, operation without central computers, expression for tie-line flow and frequency deviation, parallel operation of generators, area lumped dynamic model. **8 Hours**

UNIT - 2 & 3

AUTOMATIC VOLTAGE REGULATOR: Basic generator control loops, Cross-coupling between control loops, Exciter types, Exciter modeling, Generator modeling, Static performance of AVR loop.

AUTOMATIC LOAD FREQUENCY CONTROL:
Automatic Load frequency control of single area systems, Speed governing system, Hydraulic valve actuator, Turbine generator response, Static performance of speed governor, Closing of ALFC loop, Concept of control area, Static response of primary ALFC loop, Integral control, ALFC of multi-control area systems (POOL operation),The Two-Area system, Modeling the Tie-Line, Block Diagram representation of Two-Area system, Static response of Two-Area system and Tie-Line Bias control.

12 Hours

UNIT - 4

CONTROL OF VOLTAGE AND REACTIVE POWER: Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of voltage control, sub synchronous resonance, voltage stability, voltage collapse.

6 Hours

PART - B

UNIT - 5

OPTIMAL SYSTEM OPERATION AND UNIT COMMITMENT: Introduction , Optimal operation of generators on a bus bar, Statement of the Unit Commitment problem, need and importance of unit commitment, Constraint in Unit Commitment, Unit Commitment solution methods-Priority lists method, Forward Dynamic Programming method(excluding problem), Spinning reserve. **6 Hours**

UNIT - 6

POWER SYSTEM SECURITY: Introduction, factors affecting power system security, Security analysis, Contingency Selection, Techniques for contingency evaluation-D.C. load flow and fast decoupled load flow. **6 Hours**

UNIT 7

SYSTEM MONITORING AND CONTROL: Introduction , Energy management system, the basis of power system state estimation(PSSE), mathematical description of PSSE process, minimization technique for PSSE, Least Square estimation, Error and detection in PSSE, System security and emergency control.

6 Hours

UNIT- 8

POWER SYSTEM RELIABILITY: Introduction, Modes of failures of a system, Generating system and its performance, derivation of reliability index, reliability measure for N- unit system, cumulative probability outages- Recursive Relation, Loss of load probability, Frequency and duration of a state.

8 Hours

Text Books:

1. **Modern Power System Analysis-** I J Nagarath and D P Kothari, TMH, 3rd Edition, 2003
2. **Electrical Energy Systems Theory**, O.J Elgerd, TMH,2008.
3. **Power generation, operation and control-** Allen J Wood & Woollenberg. John Wiley and Sons, Second Edition, 2009.
4. **Electric Power Systems-** B.M.Weedy and B.J. Cory, Wiley student edition, 1999
5. **Computer Aided Power System Operation and Analysis-** R.N. Dhar, Tata McGraw-Hill, 1987.

REFERENCE:

1. **Computer Aided Power System Analysis-** G.L.Kusic, PHI,2010.
2. **Power System Analysis, Operation and Control,** Abhijit Chakrabarti and Sunita Halder, PHI, Second Edition, 2009
3. **Power system stability and control,** Prabha Kundur, TMH, 9th reprint, 2007.

ELECTIVE – IV (GROUP - D)

10EE831 REACTIVE POWER MANAGEMENT

Subject Code	:	**10EE831**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT – 1
Introduction, Importance of reactive power control in EPS, Reactive power devices. **4 Hours**

UNIT – 2
Theory of Load Compensation: Introduction- Requirement for compensation, Objectives in load compensation, Specifications of a load compensator, Power factor correction and voltage regulations in single phase system, Phase balancing and p. f. correction of unsymmetrical loads, Compensation in term of symmetrical components. **8 Hours**

UNIT – 3
Reactive Power Control: Fundamental requirement in AC Power transmission, Fundamental transmission line equation, Surge impedance and natural loading, Voltage and current profiles of uncompensated radial and symmetrical line on open circuit, Uncompensated line under load, Effect of line length, Load power and p. f on voltage and reactive power. **8 Hours**

UNIT – 4
Passive and active compensators, Uniformly distributed fixed compensation, Passive shunt compensation, Control of open circuit voltage by shunt reactance, Reactance of shunt reactors, multiple shunt reactors along the line. **6 Hours**

PART – B

UNIT - 5
Series compensation: Objectives and practical limitations, Symmetrical line with mid-point series capacitor and shunt reactor, Power transfer characteristics and maximum transmissible power for a general case, Fundamental concepts of compensation by sectioning. **6 Hours**

UNIT - 6
Principles of Static Compensation: Principle of operation of thyristor controlled reactor, Thyristors switched capacitor. Series Capacitors: Introduction, protective gear, reinsertion schemes, Varistor protective gear. **6 Hours**

UNIT – 7
Synchronous Condenser: Introduction, Power system Voltage control, Emergency reactive power supply, Starting methods, starting motor, reduced voltage starting, static starting. **6 Hours**

UNIT – 8
Harmonics effects, resonance, shunt capacitors and filters, telephone interferences, Reactive Power Co-ordination, Reactive power management, transmission benefits, reactive power dispatch & equipment impact. **8Hours**

TEXT BOOKS:

1. **Reactive power control in electric power systems**, T. J. E. Miller, John Wiley & Sons NY 2009
2. **Reactive Power Management**, D. Tagare, TMH, 1st Edition,2004.

REFERENCE BOOKS:

1. **Power System Stability and Control**,P. Kundur, TMH, 9th reprint, 2007.
2. **Power System Voltage Stability**, Carson. W. Taylor, McGraw-Hill, Inc.

10EE832 FLEXIBLE A.C. TRANSMISSION SYSTEMS (FACTS)

Subject Code	:	**10EE832**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1 & 2
Facts, Concepts and general system configuration: Transmission, interconnection, flow of power in AC system, power flow and dynamic stability consideration of a transmission interconnection, relative importance of controllable parameters, basic types of FACTs controllers, shunt, series, combined shunt and series connected controllers. **10 Hours**

UNIT -3
POWER SEMICONDUCTOR DEVICES: types of high power devices, principle of high power device characteristics and requirements, power device material, diode, MOSFET, MOS turn OFF thyristor, emitter turn OFF thyristor, integrated gate commuted thyristor (GCT & IGCT). **10 Hours**

UNIT -4
VOLTAGE SOURCED CONVERTERS: Basic concepts, single-phase full wave bridge converter operation, square wave voltage harmonics for a single-phase bridge 3-phase full wave converter. **6 Hours**

PART – B

UNIT -5
SELF AND LINE COMMUTATED CURRENT SOURCE CONVERTER: Basic concepts, 3 phase full wave rectifier, thyristor based converter, current sourced converter with turnoff devices, current sourced versus voltage source converter. **6 Hours**

UNIT -6
STATIC SHUNT COMPENSATORS SVC AND STATCOM: Objective of shunt compensation, methods of controllable Var generation, static Var compensator, SVC and STA TCOM, comparison between, SVC and STA TCOM. **10 Hours**

UNIT -7& 8
STATIC SERIES COMPENSATORS: GCSC, TSSC, TCSC and SSSC, objectives of series compensation, variables impedance type of series compensation, switching converter type series compensation, external control for series reactive compensators. **10 Hours**

TEXT BOOKS:

1. **Understanding Facts - Concepts and technology of flexible AC Transmission system,** N.G.Hungorian & Laszlo gyugyi IEEE Press, standard publisher, 2001.

REFERENCE BOOKS:

1. **EHV - AC, HYDC Transmission & Distribution Engineering,** S.Rao,Khanna publishers, 3rd edition 2003.
2. **FACTS - Controllers in Power Transmission distribution** - K.R. Padiyar - New age publishers - 2007.

10EE833 ADVANCED INSTRUMENTATION SYSTEM

Subject Code	:	**10EE833**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1
Instrumentation: Frequency meter, measurement of time and frequency (mains), tachometer, phase meter, capacitance meter. Automation in digital Instrumentation. **6 Hours**
UNIT – 2
Analyzer: Wave analyzers and Harmonic distortion, Basic wave analyzer, Frequency selective wave analyzer, Harmonic distortion analyzer and Spectrum analyzer**. 8 Hours**
UNIT – 3
Measuring Instruments: Output power meters, Field strength meter Vector impedance meter, Q meter applications-Z, Z_0 and Q. Basic LCR bridge, RX meters**. 6 Hours**
UNIT – 4
Recorders: Strip chart recorder- applications of Strip chart recorder, Magnetic recorders, Frequency modulation (FM) recording, Digital data recording, Digital memory waveform recorder. **6 Hours**

Part – B

UNIT – 5
Transducers: Synchro's, Capacitance Transducers, Load cells, Piezo electrical Transducers, IC type temperature sensors, Pyrometers, Ultrasonic temperature Transducer, Reluctance pulse pick-ups, Flow measurement-mechanical Transducers; Magnetic flow meters, turbine flow meters. β-gauge.
8 Hours
UNIT – 6
Data acquisition and conversion: Generalized data acquisition system (DAS), Signal conditioning of inputs, single channel DAS, multi channel DAS, data loggers, compact data logger. **6 Hours**
UNIT – 7
Measurement of power: Measurement of large amount of RF power (calorimetric method),measurement of power on a transmission line, standing wave ratio measurements, measurement of standing wave ratio using directional couplers. **6 Hours**
UNIT – 8
Data transmission: Serial, asynchronous interfacing, data line monitors, RS-232 standard, universal serial bus,IEEE-1394.Long distance data transmission(modems).IEEE 488 bus. Electrical interface. **6 Hours**

TEXT BOOKS:

1.**Electronic Instrumentation,**H S Kalsi,TMH,3rd Edition,2010.
2.**Modern Electronic Instrumentation and Measuring Techniques,** Cooper D and A D Helfrick,PHI,2009
3. **Stuent Reference Manual for Electronic Instrumentation Laboratories,** Stanly Wolf,Richard F H,Smith,PHI,2nd Edition,2010.

10EE834 AI APPLICATIONS TO POWER SYSTEMS

Subject Code	:	**10EE834**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

Sparsity oriented Programming: Introduction, physical structure and sparsity, pivoting, conservation of sparsity by optimal ordering of buses, schemes for ordering, UD table storage scheme.

6 Hours

UNIT - 2

Artificial Intelligence: What is AI? Definitions, history and evolution, essential abilities of intelligence, AI applications; Problem solving: problem characteristics, problem search strategies, forward and backward reasoning, AND-OR graphs, game trees, search methods- informed and uninformed search, breadth first search and depth first search methods. **8 Hours**

UNIT – 3 and 4

Knowledge representation: logical formalisms: propositional and predicate logic: syntax and semantics, wffs, clause form expressions, resolution- use of RRTs for proofs and answers, examples from electric power systems, Non-monotonic logic: TMS, modal, temporal and fuzzy logic. **12 Hours**

Part – B

UNIT – 5

Structured representation of knowledge: ISA/ISPART trees, semantic nets, frames and scripts, examples from electric systems. **07 Hours**

UNIT – 6

Expert systems: Basic components, forward and backward chaining, ES features, ES development, ES categories, ES tools and examples from electric drive systems. **07 Hours**

UNIT –7 and 8

AI languages: LisP and ProLog - Introduction, sample segments, LisP primitives, list manipulation functions, function predicates, variables, iteration and recursion, property lists, sample programs for examples from electric power systems. **12 Hours**

REFERENCE BOOKS:

1. **Introduction to Artificial Intelligence and Expert Systems,** D.W.Patterson,PHI, 2009.
2. **Computer Methods for Circuit Analysis and Design,** J.Vlach and Singhal, CBS Publishers, 1986.
3. **Artificial Intelligence,** Rich, Elaine, Kevin Knight, TMH, 3rd Edition, 2008.
4. **Introduction to AI,** Charniak E. and Mcdermott D ,Pearson Education.
5. **Problem Solving Methods in AI,** Nils J.Nilson ,McGraw-Hill, 1971.
6. **Principles of AI,** Nils J.Nilson, Berlin Springer-Verlag, 1980

10EE835 DATA BASE MANAGEMENT SYSTEMS (DBMS)

Subject Code	:	**10EE835**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT- 1
INTRODUCTION TO DATA BASE SYSTEMS : Managing data, a historical perspective, File systems versus DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Queries in DBMS, Transaction management, Structure of DBMS, People who work with databases. **4 Hours**
UNIT -2
ENITTY – RELATIONSHIP MODEL : Using high- Level Conceptual Data Models for Database Design, An example of Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY database, ER Diagrams, Naming Conventions and Design Issues. **6 Hours**
Electronic Instrumentation
RELATIONAL MODEL AND RELATIONAL ALGEBRA: Relational model concepts, relational model constraints and relational database schemes, update operations and dealing with Constraint Violations, Unary relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, examples of Queries in Relational algebra, relational database design using ER-to-Relational mapping. **6 Hours**

UNIT- 4
SQL –THE RELATIONAL DATABASE STANDARD : SQL Data definition and data types, specifying basic constraints in SQL, Schemes, Change statements in SQL, basic Queries in SQL, more complex SQL queries, Insert, Delete and update statements in SQL, additional features SQL, specifying general constraints as assertion, views (virtual tables) in SQL, database Programming, issues and Techniques, Embedded SQL, Dynamic SQL, more examples; PL/SQL **10 Hours**

PART- B

UNIT- 5
DATABASE DESIGN: Informal Design Guidelines for Relation Schemes, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties of Relational Decompositions. **6 Hours**

UNIT- 6
b: Introduction Security, Access control, Discretionary Access, Mandatory Access Control
6 Hours
UNIT – 7 & 8
TRANSACTION MANAGEMENT:The ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Lock-based Concurrency control, performance of locking, Transaction support In SQL, Introduction to crash recovery; 2PL, for serializability and recoverability, Introduction to lock management, Lock Conversions, Dealing with Deadlocks, Specialized locking Techniques, Concurrency control without locking, Introduction to ARIES, The log, Other Recovery related Data Structures, The write-ahead log Protocol, Check pointing, Recovering from a System Crash, Media Recovery, Other Algorithms and Interaction with Concurrency control. **14 Hours**

TEXT BOOKS:

1. **Database Management Systems,** Raghu Ramakrishnan and Johannes Gehrke, McGraw Hill, 3rd Edition, 2003.
.
2. **Fundamentals of Database Systems,** Elmasri and Navathe, Pearson Education, 5th Edition, 2003.

REFERENCE:

1. **Database System concepts,** Silberschatz Kortts Sudharshan , McGraw Hill, 5th edition,2006.
2. **Database System concepts,** Peter Rob, Carlos Coronel, Cengage Learning,First Edition,2008

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1
ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2
SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3
SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Bo x type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4
SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Po nd and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fund amentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-a lone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5
WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6
BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KV IC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7
ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8
EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

1. **Non-Conventional Sources of Energy,**Rai, G. D, Khanna Publishers, 4th Edition, 2007
2. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

ELECTIVE –V (GROUP - E)

10EE841 POWER SYSTEMS DYNAMICS AND STABILITY

Subject Code	:	**10EE841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Basic concepts, Review of classical methods. **2 Hours**
UNIT - 2 & 3
SYSTEM MODELING AND DYNAMICS OF SYNCHRONOUS GENERATOR: Modeling of synchronous machine, Swing equation, Park's transformation – Park's voltage equation, Park's mechanica l equation (torque). Applications – (a) Voltage build up in synchronous machine, and (b) Symmetrical short circuit of generator. Solution for transient analysis, Operational impedance, Relationship between Tdo/ and Tdo//, Algebraic constraints. **14 Hours**
UNIT - 4
EXCITATION AND PRIME MOVER CONTROLLERS: Introduction, Types of excitation, AVR with and without ESS, TGR, Amplifier PSS, Static exciters. **8 Hours**

PART - B

UNIT - 5
MODELING OF PRIME MOVERS: Introduction, Three major components, Block diagram, Hydraulic turbine, Steam turbine. **8 Hours**
UNIT - 6
LOAD MODELING: Introduction, Two approaches – Polynomial model an d Exponential model. Small Signal Angle Stability: Small signal angle stability with SMIB system, detailed model of SMIB. **10 Hours**

UNIT - 7 & 8

TRANSIENT STABILITY ANALYSIS: Simulation for Transient stability Evaluation, Transient stability controllers. **10 Hours**

TEXT BOOKS:

1. **Power System Dynamics, Stability and Control**,Padiyar K.R., Interline Publications.
2. **Power System Stability and Control,** Prabha Kundur. TMH, 9^{th} Reprint.

REFERENCE BOOKS:

1. **Dynamics and Control of Large Electric Power Systems,** Marija Ilic; John Zaborszky, , IEEE Press and John Wiley & Sons, Inc, 2007
2. **Power System Control and Stability Revised Printing,** Paul M. Anderson and A. A. Fouad, IEEE Press and John Wiley & Sons, Inc, 2002.
3. **Selected topics from IEEE Transaction and Conference Proceedings**

10EE842 ENERGY AUDITING & DEMAND SIDE MANAGEMENT

Subject Code	:	**10EE842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Energy situation – world and India, energy consum ption, conservation, Codes, standards and Legislation. **6 Hours**

UNIT - 2

ENERGY ECONOMIC ANALYSIS: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems. **7 Hours**

UNIT - 3

ENERGY AUDITING: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results. **8 Hours**

UNIT - 4

ELECTRICAL SYSTEM OPTIMIZATION: The power triangle, motor horsepower, power flow concept. **5 Hours**

PART - B

UNIT - 5 & 6

ELECTRICAL EQUIPMENT AND POWER FACTOR –correction & location of capacitors, energy efficient motors, lighting basics, electrical tariff, Concept of ABT. **10 Hours**

UNIT - 7 & 8

DEMAND SIDE MANAGEMENT: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-util ity power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs. **16 Hours**

TEXT BOOKS:

1. **Industrial Energy Management Systems,** Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York.

2. **Fundamentals of Energy Engineering -** Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey.

3. **Electrical Power distribution**, A S. Pabla, TMH, 5th edition, 2004

REFERENCE BOOKS:

3. **Recent Advances in Control and Management of Energy Systems**, D.P.Sen, K.R.Padiyar, Indrane Sen, M.A.Pai, Interline Publisher, Bangalore, 1993.
4. **Energy Demand – Analysis, Management and Conservati on,** Ashok V. Desai, Wiley Eastern, 2005.
5. **Demand Side Managementm,** Jyothi Prakash, TMH Publishers.
6. **Hand book on energy auditing** - TERI (Tata Energy Research Institute)

10EE843 DATA COMMUNICATIONS AND NETWORKING

Subject Code	:	**10EE843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Data Communications; Networks; the Internet; Protocols and Standards; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite**. 6 Hours**

UNIT - 2

DATA, SIGNALS, AND DIGITAL TRANSMISSION : Analog and digital signals; Transmission impairment; Data rate limits; Performance; Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes. **8 Hours**

UNIT - 3

ANALOG TRANSMISSION AND MULTIPLEXING: Digital - to - Analog conversion; Analog - to - Analog conversion; Multiplexing; Spread spectrum. **6 Hours**

UNIT - 4

TRANSMISSION MEDIA, ERROR DETECTION AND CORRECTION: Twisted pair cable, Coaxial cable, Fibre-Optic cable, Radio waves, Microwaves, Infrared. Introduction to error detection / correction; Block coding; Linear block codes; Cyclic codes, Checksum. **6 Hours**

PART - B

UNIT - 5

DATA LINK CONTROL: Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases. **7 Hours**

UNIT - 6

MULTIPLE ACCESS, ETHERNET: Random Access; Controlled Access; Channelization. Ethernet: IEEE standards; Standard Ethernet and changes in the standard; Fast Ethernet; Gigabit Ethernet. **7 Hours**

UNIT - 7

WIRELESS LANS AND CONNECTION OF LANS: IEE 802.11; Bluetooth. Connecting devices; Backbone Networks; Virtual LANs. **6 Hours**

UNIT - 8

OTHER TECHNOLOGIES: Cellular telephony; SONET / SDH: Architecture, Layers, Frames; STS multiplexing. ATM: Design goals, problems, architecture, switching, layers. **6 Hours**

TEXT BOOK:

1. **Data Communications and Networking** – Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition, , 2006.

REFERENCE BOOKS:

1. **Communication Networks: Fundamental Concepts and Key Architectures -** Alberto Leon, Garcia and Indra Widjaja, , Tata McGraw- Hill ,2nd Edition, 2004.
2. **Data and Computer Communication**, William Stallings, Pearson Education, 8th Edition, 2007.

3. **Computer Networks: A Systems Approach -** Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
4. **Introduction to Data Communications and Networking** – Wayne Tomasi, Pearson Education, 2005.
5. **Computer and Communication Networks** – Nader F. Mir, Pearson Education, 2007.

10EE843 ELECTRICAL DISTRIBUTION SYSTEMS

Subject Code	:	**10EE844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
POWER SYSTEM PLANNING AND AUTOMATION: Introduction, Factors affecting system planning, present planning techniques, planning models, future trends in planning, systems approach, distribution automation. **8 Hours**

UNIT - 2
LOAD CHARACTERISTIC: Basic definition, relation between load and load factor, load growth.
6 Hours

UNIT - 3 & 4
3. SYSTEM PLANNING: Planning process, planning criteria, system developers, dispersed generation, distribution systems, economics and finance, mapping. **12 Hours**

PART - B

UNIT - 5 & 6
DESIGN AND OPERATION: Engineering design, operation criteria, substation and feeder, voltage control, harmonics, load variations, system losses, energy management. **10 Hours**

UNIT - 7
DISTRIBUTION AUTOMATION: Definitions, communication, sensors, SCADA. **8 Hours**

UNIT - 8
OPTIMIZATION: Introduction, costing of schemes, typical network configurations, planning terms, network cost modeling, synthesis of optimum line network. **8 Hours**

TEXT BOOKS:

1. **Electric power distribution system engineering,** Turan Gonen, CRC Press,2nd Edition.
2. **Electric power distribution**-A S. Pabla, TMH, 5th edition, 2004
3. **Hand Book of Electrical Power Distribution,** Gorti Ramamurthy,University Press,2nd Edition,2009.

10EE845 INSULATION ENGINEERING

Subject Code	:	**10EE845**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
ELECTROSTATIC FIELD, THEIR CONTROL AND ESTIMATIONS: Electric Field Intensity, Electric Strength, Classification of Electric Fields, Degree of Uniformity of Electric Fields, control of Electric field Intensity (stress control), Estimation of Electric Field Intensity, Basic Equations for potential and Field Intensity in Electrostatic Fields, Analysis of Electric Field Intensity in Homogeneous Isotropic single dielectric only direct solution of Laplace equation, Analysis of Electric field Intensity in Isotropic Multi dielectric system. **7 Hours**

UNIT - 2
INSULATION SYSTEM IN POWER SYSTEM APPARATUS: Insulation system in capacitors, bushings, and transformers modes of failure of insulation systems. Insulations used in rotating machines.
6 Hour

UNIT - 3
DIELECTRIC PHENOMENA: Dielectric phenomena in in solid insulation. Macroscopic approach for describing the Dielectric phenomena microscopic treatment for Dielectric phenomena. **7 Hours**

UNIT - 4
PROPERTIES OF INSULATION MATERIALS: Introduction to properties of solid insulating materials (both of natural origin and synthetic types) Properties of liquid insulating materials. **6 Hours**

PART - B

UNIT - 5
GASEOUS INSULATION: Requirement of gaseous insulation. Breakdown process: types of collision, Elastic and inelastic, collision cross-section, Mobility of ions, Diffusion of charges, Emission of radiation and excitation, various secondary process and recombination, Mobility controlled and diffusion controlled breakdown. Gas insulated substations. **9 Hours**

UNIT – 6 ,7 and **8**
AGEING PHENOMENA: Failure of electric insulation due to ageing. Ageing mechanisms- Thermal ageing, Electrical ageing, combined thermal and electrical ageing.
Analysis of insulation failure data, Power law model, Graphical estimation of power law constants, ageing date, plotting position and cumulative probability. **17 Hours**

TEXT BOOKS:
1. **Fundamentals of gaseous ionization and plasma electronics,** Nasser E. John Wiley Interscience, New York, 1971.
2. **Methods of statistical analysis and life data,** Hann N.R. Schafer R.E. and Singapore wall N.D. John Wiley and sons, New York, 2002.
3. **Theory of electric polarization**, Bother C.J.F. Elsevier Publications.
4. **High Voltage Insulation Engineering,** Ravindra Arora, Wolfgang Mosch, New age International Publishers Ltd.

REFERENCE BOOKS:
1. **Electrical insulation,** Bradwell A. Peter Peregrinus Ltd, London, 1993.
2. **Electrical breakdown of gases,** J.M. Meek and J.D. Craggs, "Oxford university pres s, 11953
3. **High voltage Engineering fundamentals,** E. Kufell and W.S. Zaengl, and J. Kufell, 2^{nd} edition, Elsevier 2005
4. **High voltage Engineering,** M.S. Naidu and V Kamaraju, TMH, 4^{th} edition, 2008.
5. **Gas Insulated Substations**, M.S. Naidu,I K International Publishing House,2008 Edition.

10EE846 INTELLECTUAL PROPERTY RIGHTS

Subject Code	:	**10EE846**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, Protection of Knowledge in general, International Treaties-Paries Convention, TRIPS-treaty.
4 Hour

UNIT – 2
Intellectual Property Rights with exception of Patents – Copyright and neighboring rights, Auteurswet 1912, Neighboring rights, Database law, unified Benelux law relating to Trademarks, Trade Name law.
8 Hour

UNIT – 3 and 4
Utility model,Unified Benelux law relating to Industrial Designs, Protection of Plant Varities, Topographies and Semiconductor Products, Countering inadmissible competition. **12 Hour**

PART – B

UNIT – 5
Legal Regulations relating to Patents – Strasbourg Treaty, European Patent convention, Patent Cooperation Treaty, Patent Law Treaty. **6 Hour**

UNIT – 6
Obtaining a European Patent-official procedure in Europe, Rights conferred by a European Patent Application or a European Patent, International Patent Application-Official International procedure, Rights conferred by an International Patent Application. **10 Hour**

UNIT – 7
Patent Systems in Germany and United Kingdom, Patent System in USA, Patent System in Japan, Patent System in India. **6Hour**

UNIT – 8
Selected Topics – Novelty and Incentive Step, Indus trial Application, Supplementary Protection Certificates**,** What does a Patent Attorney do with patents? **6 Hour**

TEXT BOOKS:
1**. Intellectual Proper Law,** Narayan P, Eastern Law House(P)Ltd.
2**. Law of Patent,** Elizabeth Berti, Eastern Book Company,India,First Edition, 2005.
3. **Managing Intellectual Property-The Strategic Imperative**, Vonod V Sople,PHI,2008

REFERENCE BOOKS:
1. **Intellectual Property,** David Brainbridge, Pearson Education,5th Edition, Indian Reprint,2003**.**

10EE847 ELECTRICAL POWER QUALITY

Subject Code	:	**10EE847**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, Power quality-voltage quality, power quality evaluation procedures term and definitions: general classes of power quality problems, transients, long duration voltage variation, short duration voltage variations, voltage imbalance, waveform distortion, power quality terms. **8 Hours**

UNIT - 2
VOLTAGE SAGS AND INTERRUPTIONS: Sources of sags and interruptions, estimating voltage sag performance, fundamental principles of protection, motor starting sags. **6 Hours**

UNIT - 3 & 4
TRANSIENT OVER VOLTAGES: Sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, Fundamentals of harmonics: Harmonic distortion, voltage versus transients, harmonic indexes, harmonic sources from commercial loads, harmonic sources from Industrial loads, effects of harmonic distortion, intraharmonics. **10 Hours**

PART - B

UNIT - 5
APPLIED HARMONICS: Harmonic distortion evaluations, principles for controlling harmonics, harmonic studies, devices for controlling harmonic distortion, harmonic filters, standards of harmonics
8 Hours

UNIT - 6
POWER QUALITY BENCHMARK: Introduction, benchmark process, power quality contract, power quality state estimation, including power quality in distribution planning. **6 Hours**

UNIT - 7
DISTRIBUTED GENERATION AND QUALITY: DG technologies, interface to utility system, power quality issues, interconnection standards. **6 Hours**

UNIT - 8
POWER QUALITY MONITORING: Monitoring considerations, power quality measurement equipments, assessment of power quality measurement data, application of intelligent systems, power quality monitoring standards. **8 Hours**

TEXT BOOK:
1. **Electric Power Quality,**Dugan, Roger C, Santoso, Surya, McGranaghan, Mark F/ Beaty, H. Wayne McGraw-Hill professional publication 2003.

REFERENCE BOOKS:
1. **Electric Power Quality,** G.T.Heydt, stars in a circle publications 1991.
2. **Modern Power Electronics,** M.H.Rashid TATA McGraw Hill 2002.
3. **Understanding power quality problems voltage sags and interruptions-** Math H. J. Bollen. IEEE Press, 2000
4. **Power quality in power systems and electrical machines,** Ewald F Fuchs ,Mohammad A.S., Masoum,Academic Press,Elsevier,2009.

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10MAT31 ENGINEERING MATHEMATICS – III

Subject Code	:	10MAT31	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES32 ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10ES32	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES33 LOGIC DESIGN (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10ES33	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES34 NETWORK ANALYSIS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10ES34	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Basic Concepts: Basic definitions. Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

7 Hours

UNIT 2:

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, solution of resistive networks, principle of duality**.**

7 Hours

UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems

6 Hours

UNIT 4:
Network Theorems - II:
Thevenin's and Norton's theorems, Maximum Power tra nsfer theorem

6 Hours

PART – B

UNIT 5:
Resonant Circuits: Series and parallel resonance, frequency-response of series and parallel circuits, Q factor, Bandwidth. **6Hours**

UNIT 6:
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. **7 Hours**

UNIT 7:
Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis

7 Hours

UNIT 8:
Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets

6 Hours

TEXT BOOKS:

1. **Engineering Circuit Analysis,** Hayt, Kemmerly and Durbin,TMH ,7th Edition, 2010
2. **Networks and systems,** Roy Choudhury, New Age International Publications.,2nd edition, 2006 re-print,

REFERENCE BOOKS:

1. **Electric Circuits,** Schaum's Outlines,M Nahvi & J A Edminister,TMH,5th Edition,2009**.**
2. **Network Analysis,** M. E. Van Valkenburg, PHI, 3rd Edition, Reprint 2009.
3. **Analysis of Linear Systems**, David K. Cheng, Narosa Publishing House, 11th reprint, 2002

10EE35 ELECTRICAL and ELECTRONIC MEASUREMENTS and INSTRUMENTATION

Subject Code	:	**10EE35**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
1-(a) Units and Dimensions: Review of fundamental and derived units. S.I. units. Dimensional equations, problems. **3 Hours 1-(b) Measurement of Resistance:** Wheatstone's bridge, sensitivity, limitations. Kelvin's double bridge. Earth resistance, measurement by fall of potential method and by using Megger. **3 Hours**

UNIT 2:
Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's inductance bridge, Maxwell's inductance &capacitance bridge,Hay's brid ge, Anderson's bridge, Desauty's bridge, Schering bridge. Shielding of bridges. Problems. **07 Hours**

UNIT 3:
Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation),Silsbees's method of testing CT. **07 Hours**

UNIT 4:
Measurement of Power and Energy: Dynamometer wattmeter. UPF and LPF wattmeters, Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory , errors, adjustments and calibration. Principle of working of electronic energy meter. 0**6 Hours**

PART – B

UNIT 5:
(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. 0**4 Hours**
(b) Electronic Instruments: Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. 0**4 Hours**
UNIT 6:
Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring voltage, current, phase, frequency and period. Use of Lissajous patterns. Working of a digital storage oscilloscope. Brief note on current probes. 0**6 Hours**

UNIT 7:
Transducers: Classification and selection of transducers. Strain gauges. LVDT. Measurement of temperature and pressure. Photo-conductive and photo-voltaic cells.
0**6 Hours**
UNIT 8:
(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems.
2 Hours
(b) Display Devices and Signal Generators: X-Y recorders. Nixie tubes. LCD and LED display. Signal generators and function generators. **4 Hours**

Text Books

3. **Electrical and Electronic Measurements and Instrumentation,** A. K. Sawhney, Dhanpatrai and Sons, New Delhi.
2. **Modern Electronic Instrumentation and Measuring Techniques,** Cooper D. and A.D. Heifrick, PHI, 2009 Edition.

References

1. **Electronic Instrumentation and Measurement,** David A. Bell, oxford Publication ,2^{nd} Edition, 2009.
4. **Electrical Measurements and Measuring Instruments,** Golding and Widdies, Pitman

10EE36 ELECTRIC POWER GENERATION

Subject Code	:	**10EE36**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Sources of Electrical Power: Wind, solar, fuel cell, tidal, geo-thermal, hydro-electric, thermal-steam, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation. Combined heat and power distributed generation. 06 **Hours**
UNIT 2:
Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. 06 **Hours**

UNIT 3:
(a) Hydro Power Generation: Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. 5 **Hours**
(b) Thermal Power Generation: Introduction. Main parts of a thermal power plant. Working. Plant layout. **3 Hours**
UNIT 4:
Nuclear Power Station: Introduction. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. **6 Hours**

PART – B

UNIT 5 and 6:
(a) Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor and loss factor, load duration curve. Cost of generating station, factors influencing the rate of tariff designing, tariff, types of tariff**.** Power factor improvement.
(b) Substations: Introduction, types, Bus bar arrangement schemes, Location of substation equipment. Reactors and capacitors. Interconnection of power stations. 1**4 Hours**
UNIT 7 and 8 :
Grounding Systems: Introduction, grounding systems. Neutral grounding. Ungrounded system. Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **12 Hours**

Text Books

1. **Power System Engineering,** A. Chakrabarti, M. L. Soni, and P.V. Gupta, Dhanpat Rai and Co.,NewDelhi.

2. **Electric Power Generation, Transmission and Distribution,** **S.** N. Singh, PHI, 2nd Edition,2009.

References

1. **Elements of Electrical Power System Design,** M. V. Deshpande, PHI,2010

10ESL37 ANALOG ELECTRONICS LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10EEL37	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

10ESL38 LOGIC DESIGN LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10EEL38	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

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FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

IV SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code	Title	Teaching Dept.	Teaching hours/week		Examination			
			Theory	Practical	Duration in hours	Marks		
						I. A	Theory/ Practical	Total Marks
10MAT 41	Engineering Mathematics - IV	Mat	04	-	03	25	100	125
10ES42	Microcontrollers	@	04	-	03	25	100	125
10ES43	Control Systems	@	04	-	03	25	100	125
10EE44	Field Theory	E&EE	04	-	03	25	100	125
10EE45	Power Electronics	E&EE	04	-	03	25	100	125
10EE46	Transformers and Induction Machines	E&EE	04	-	03	25	100	125
10ESL47	Microcontrollers Lab	@	-	03	03	25	50	75
10EEL48	Power Electronics Lab	E&EE	-	03	03	25	50	75
		Total	24	06	24	200	700	900

Note : @ indicates concerned discipline. ES (for theory) & ESL (for Lab) in the subject code indicates that the subject is common to Electrical and Electronics stream consisting of EE/EC/IT/TC/ML/BM branches of engineering. EE indicates, subjects specific to E & EE branch only.

10MAT41 ENGINEERING MATHEMATICS – IV

Subject Code	:	**10MAT41**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES 42 MICROCONTROLLERS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10ES42**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10ES43 CONTROL SYSTEMS (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	10ES43	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Modeling of Systems: Introduction to Control Systems, Types of control systems, Effect of feedback systems, Differential equations of physical systems – Mechanical systems- Friction, Translational syst ems (Mechanical accelerometer, Levered systems excluded), Rotational systems, Gear trains. Electrical systems, Analogous systems. **6 Hours**

UNIT 2:
Block diagrams and signal flow graphs: Transfer functions, Block diagrams, Signal Flow graphs (State variable formulation excluded). **7 Hours**

UNIT 3:
Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. **7Hours**

UNIT 4:
Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh-Hurwitz stability criterion, Relative stability analysis; Special cases of RH criterion. **6 Hours**

PART – B

UNIT 5:
Root–Locus Techniques : Introduction, basic properties of root loci, Construction of root loci. **6 Hours**

UNIT 6:
Stability analysis in frequency domain: Introduction, Mathematical preliminaries, Nyquist Stability criterion, (Inverse polar plots excluded), Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded). **7Hours**

UNIT 7:
Frequency domain analysis: Correlation between time and frequency response, Bode plots, All pass and minimum phase systems, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. **7 Hours**

UNIT 8:
Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations. **6 Hours**

TEXT BOOK :

1. Control Systems Engineering, I. J. Nagarath and M.Gopal, New Age International (P) Limited, 4th Edition – 2005

2 Modern Control Engineering, K. Ogata, PHI, 5th Edition, 2010.

REFERENCE BOOKS:

1. **Control Systems Engineering,**Norman S Nise,Wiley Student Edition,5th Edition,2009
2. **Automatic Control Systems**, Benjamin C.Kuo and Farid Golnaaghi, Wiley Student Edition,8th Edition,2009
3. **Feedback and Control Systems**,Joseph J Distefano III and other, Schaum's Outlines,TMH,2nd Edition,2007
4. **Control Systems**, Ananda Kumar, PHI,2009.

10EE44 FIELD THEORY

Subject Code	:	10EE44	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT -1

a. Coulomb's Law and electric field intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge. **03 Hours**

b. **Electric flux density, Gauss' law and divergence:** Electric flux density, Gauss' law, Divergence, Maxwell's First equation (Electrostatics), vector operator and divergence theorem **04 Hours**

UNIT- 2

a. **Energy and potential:** Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient, Energy density in an electrostatic field **04 Hours b. Conductors, dielectrics and capacitance:** Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions, boundary conditions for perfect dielectrics, capacitance and examples. **03 Hours**

UNIT- 3

Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations. **06 Hours**

UNIT -4

The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials. **06 Hours**

PART – B

UNIT- 5

a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

03 Hours

b. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance.

04 Hours

UNIT-6

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's e quation in point and Integral form, retarded potentials.

06 Hours

UNIT- 7
Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors, skin effect.
07HOURS
UNIT- 8
Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions. **06 Hours**

TEXT BOOK:
3. **Engineering Electromagnetics,** William H Hayt Jr. and John A Buck**,** Tata McGraw-Hill, 7th edition, 2009.
4. **Principles of Electromagnetics,** Matthew N.O. Sadiku, 4th Edition, Oxford University Press, 2009.

REFERENCE BOOKS:
1. **Electromagnetics with Applications,** John Krauss and Daniel A Fleisch, McGraw-Hill, 5th edition, 1999.
2. **Electromagnetism-Theory and Applications,** Ashutosh Pramanik, PHI, 2nd edition,Reprint 2009.
3. **Field and Wave Electromagnetics**, David K Cheng, Pearson Education Asia, 2nd edition, - 1989, Indian Reprint – 2001.

10EE45 POWER ELECTRONICS

Subject Code	:	**10EE45**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:
Power Semiconductor Devices:
Introduction to semiconductors, Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic converters and industrial applications-Drives, Electrolysis, Heating, Welding, Static Compensators, SMPS, HVDC power transmission, Thyristorized tap changers and Circuit breakers.
7 hours

UNIT 2:
Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's and IGBT's –characteristics, gate drive , di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **6 Hours**

UNIT 3:
Thyristors
Introduction, Two Transistor Model, characteristics-static and dynamic. di/dt and dv/dt protection. Ratings of thyristors. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Design of firing circuits using UJT, R, R-C circuits. Analysis of firing circuits using operational amplifiers and digital IC's. **7 Hours**
UNIT 4:
Commutation Techniques: Introduction. Natural Commutation. Forced commutation- self-commutation, impulse commutation, resonant pulse commutation and complementary commutation. **6 Hours**

PART – B

UNIT 5:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters.
7 Hours

UNIT 6:

Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **6 Hours**

UNIT 7:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. **7 Hours**

1

UNIT 8:

(a)AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase, bi-directional controllers with resistive and R-L loads.

(b) Electromagnetic Compatibility: Introduction, effect of power electronic converters and remedial measures.

6 Hours

Text Book:

1. **Power Electronics,** M.H.Rashid, , Pearson, 3rd Edition, 2006.

2. **Power Electronics,** M.D. Singh and Khanchandani K.B., T.M.H., 2nd Edition,2001

References

1. **Power Electronics Essentials and Applications**,L.Umanand, Wiley India Pvt Ltd,Reprint,2010
2. **Thyristorised Power Controllers,** G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, New Age International Publishers.
3. **Power Electronics – Converters, Applications and De sign,** Ned Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons,2008.
4. **Power Electronics: A Simplified Approach,** R.S. Ananda Murthy and V. Nattarasu, pearson/Sanguine Technical Publishers.

10EE46 TRANSFORMERS AND INDUCTION MACHINES

Subject Code	:	**10EE46**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT 1:

Basic Concepts: Principle of operation of transformer, Constructional details of shell type and core type single-phase and three-phase transformers. EMF equation, operation of practical power transformer under

no load and on load (with phasor diagrams).Concept of ideal transformers, current inrush in transformers.
6 Hours

UNIT 2:
Single-phase Transformers: Equivalent circuit, losses, efficiency, condition for maximum efficiency, all day efficiency. Open circuit and Short circuit tests, calculation of parameters of equivalent circuit. Regulation, predetermination of efficiency and regulation. Polarity test, Sumpner's test.
6 Hours

UNIT 3:
Parallel operation - need, conditions to be satisfied for parallel operation. Load sharing in case of similar and dissimilar transformers. Auto-transformers, copper economy. Brief discussion on constant voltage transformer, constant current transformer. **6 Hours**

UNIT 4:
Three-phase Transformers: Introduction, choice between single unit three-phase transformer and bank of single-phase transformers. Transformer connection for three phase operation – star/star,delta/delta,star/delta,zigzag/star and vee/vee,choice of connection. Phase conversion - Scott connection for three-phase to two-phase conversion. Labeling of three-phase transformer terminals, phase shift between primary and secondary and vector groups. Conditions for parallel operation of three-phase transformers,load sharing. Equivalent circuit of three-phase transformer. **8 Hours**

PART – B

UNIT 5:
Basic Concepts of three phase Induction Machines: Concept of rotating magnetic field. Principle of operation, construction, classification and types - single-phase, three-phase, squirrel-cage, slip-ring. Slip, torque, torque-slip characteristic covering motoring, generating and braking regions of operation. Maximum torque**. 7 Hours**

UNIT 6:
Three-phase Induction Motor: Phasor diagram of induction motor on no-load and on load. equivalent circuit Losses, efficiency, No-load and blocked rotor tests. Circle diagram and performance evaluation of the motor. Cogging and crawling. **6Hours**

UNIT 7:
High torque rotors-double cage and deep rotor bars.Equivalent circuit and performance evaluation of double cage induction motor. Induction generator – externally excited and self excited. Importance of induction generators in windmills. **6 Hours**

UNIT 8:
(a) Starting and speed Control of Three-phase Induction Motors: Need for starter. Direct on line (DOL), Star-Delta and autotransformer starting. Rotor resistance starting. Soft(electronic) starters. Speed control - voltage, frequency, and rotor resistance. **4 Hours**

(b) Single-phase Induction Motor: Double revolving field theory and principle of operation. Types of single-phase induction motors: split-phase, capacitor start, shaded pole motors. Applications. **3 Hours**

Text Books

1. **Electric Machines,** I. J. Nagrath and D. P. Kothari, T.M.H,4th Edition,2010.
2. **Electric Machines,** Mulukuntla S.Sarma, Mukesh K.Pathak, Cengage Learing,First edition,2009.

References

1. **Performance and Design of A.C. Machines,** M. G. Say,C.B.S. Publishers, 3rd Edition,2002.
2. **Theory of Alternating Current Machines,** Alexander Langsdorf, T.M.H, 2nd edition,2001..
3. **Electrical Machines and Transformers,** Kosow, Pearson, 2nd edition, 2007.
4. **Transformers,** BHEL, TMH,2nd Edition, Eight reprint 2008.

10ESL47 MICROCONTROLLERS LAB (Common to EC/TC/EE/IT/BM/ML)

Subject Code	:	**10EEL47**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

10EEL48 POWER ELECTRONICS LAB

Subject Code	:	**10EEL48**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier and A.C. voltage controller.
5. Single-phase controlled full-wave rectifier with *R* and *R-L* loads.
6. A.C. voltage controller using TRIAC and DIAC combination connected to *R* and *R-L* loads.
9. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
10. Speed control of D.C. motor using single semi converter
9. Speed control of a stepper motor.
10. Speed control of universal motor using A.C. voltage controller.
11. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.
12. Study of commutation using LC circuits and auxiliary circuits.

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FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

V SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
01	10AL51	Management and Entrepreneurship	@	4	-	3	25	100	125
02	10EE52	Signals and Systems	E&EE	4	-	3	25	100	125
03	10EE53	Transmission and Distribution	E&EE	4	-	3	25	100	125
04	10EE54	D.C. Machines and Synchronous Machines	E&EE	4	-	3	25	100	125
05	10EE55	Modern Control theory	E&EE	4	-	3	25	100	125
06	10EE56	Linear IC's and Applications	E&EE	4	-	3	25	100	125
07	10EEL57	Measurements and Circuit Simulation Laboratory	E&EE	-	3	3	25	50	75
08	10EEL58	Transformers and Induction Machines Laboratory	E&EE	-	3	3	25	50	75
Total				24	06	24	200	700	900

@- Any Engineering department or department of Business study.

10AL51 Management and Entrepreneurship

Subject Code	:	**10AL51**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

10EE52 SIGNALS AND SYSTEMS

Subject Code	:	**10EE52**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION-Definitions of signals and a system, classification of signals, basic operations on signals, elementary signals viewed as interconnections of operations, properties of systems. **10 Hours**

UNIT – 2 and 3
TIME – DOMAIN REPRESENTATIONS FOR LTI SYSTEMS- Convolution, impulse response, properties, solution of differential and difference equations, block diagram representation. **10 Hours**
UNIT - 4
FOURIER REPRESENTATION OF PERIODIC SIGNALS-Introduction, Fourier representation of continuous-time periodic signals (FS), properties of continuous-time Fourier series (excluding derivation of defining equations for CTFS), Fourier representation of discrete-time periodic signals, properties of discrete-time Fourier series (DTFS). **6 Hours**

PART - B

UNIT - 5
THE CONTINUOUS-TIME FOURIER TRANSFORM-Representation of a periodic signals: continuous-time Fourier transform (FT), Properties of continuous-time Fourier transform. Application; frequency response of LTI systems, Solutions of differential equations. **7 Hours**

UNIT - 6
THE DISCRETE-TIME FOURIER TRANSFORM-Representations of periodic signals: The discrete-time Fourier transform (DTFT), Properties of DTFT. Application; frequency response of LTI systems, Solutions of differential equations. **7 Hours**
UNIT –7 and 8
Z- TRANSFORMS-Introduction, Z-transform, properties of ROC, properties of Z-transforms, inversion of Z-transform methods - power series and partial expansion, Transforms analysis of LTI systems, transfer function, stability and causality, unilateral Z-transform and its application to solve difference equations.
12 Hours

TEXT BOOKS:
1. **Signals and Systems-** Simon Haykin and Barry Van Veen, John Wiley & Sons, 2nd Edition 2008.
2. **Fundamentals of Signals and Systems** - Michel J Roberts, TMH, 2nd Edition,2010.

REFERENCE BOOKS:
1. **Signals and Systems**, Alan V Oppenheim, Alan S. Willsky and S. Hamid Nawab,PHI, 2nd edition, 2009.
3. **Signals and Systems,** H P Hsu and others, Schaums Outline Series, TMH,2nd Edition,2008.

10EE53 TRANSMISSION AND DISTRIBUTION

Subject Code	:	10EE53	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
TYPICAL TRANSMISSION & DISTRIBUTION SYSTEMS SCHEME-General layout of power system, Standard voltages for transmission, advantages of high voltage transmission. Transmission line efficiency and line drop. Feeders, distributors & service mains. **5 Hours**

UNIT - 2
OVERHEAD TRANSMISSION LINES- Types of supporting structures and line conductors used. Sag calculation- supports at same level and at different levels. Effect of wind and ice, Sag at erection, Stringing chart and sag templates. Line vibrators. **5 Hours**

UNIT – 3
INSULATORS- Introduction, materials used, types, potential distribution over a string of suspension insulators. String efficiency & methods of increasing strings efficiency, grading rings and arcing horns. Testing of insulators. **6 Hours**
UNIT - 4
(A)CORONA- Phenomena, disruptive and visual critical voltages, corona power loss. Advantages and disadvantages of corona. **4 Hours**
(B)**UNDERGROUND CABLES**- Types, material used, insulation resistance, thermal rating of cables, charging current, grading of cables, capacitance grading & inter sheath grading, testing of cables.
6 Hours

Part - B

UNIT – 5 and 6
Line parameters: calculation of inductance of single phase line, 3phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Inductance of composite conductor lines. Capacitance- of single-phase line, 3phase lines with equilateral spacing, unsymmetrical spacing, double circuit and transposed lines. Capacitance of composite conductor lines. **12 Hours**

UNIT - 7
Performance of power transmission lines- Short transmission lines, medium transmission lines- nominal T, end condenser and π models, long transmission lines, ABCD constants of transmission lines, Ferranti effect, line regulation. **8 Hours**

UNIT - 8
Distribution- Requirements of power distribution, radial & ring main systems, ac and dc distribution: calculation for concentrated loads and uniform loading. **6 Hours**
TEXT BOOKS:

1. **A Course in Electrical Power-** Soni Gupta & Bhatnaagar, Dhanpat Rai & Sons.
2. **Electrical Power Systems**- C. L. Wadhwa, New Age International,5th Edition,2009.

REFERENCE BOOKS:

1. **Elements of Power System Analysis**- W.D. Stevenson, TMH,4th Edition
2. **Electric power generation Transmission & Distribution**- S. M. Singh, PHI,2nd Edition, 2009.
3. **Electrical Power-** Dr. S. L. Uppal, Khanna Publications

10EE54 D.C. MACHINES AND SYNCHRONOUS MACHINES

Subject Code	:	**10EE54**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
DC GENERATOR-Review of basics of DC machines, classification of DC generator, types of armature winding, EMF equation, no-load characteristic, armature reaction, load characteristics. Commutation, types of Commutation, commutation difficulties, interpoles, compensating winding and equalizer rings (only qualitative treatment).

8 Hours

UNIT - 2
DC Motors- (a) Classification, Back EMF and its significance, Torque equation, Characteristics of shunt, series & compound motors, speed control of shunt, series and compound motors.Application of motors. DC motor starters
(b) Special DC motors- permanent magnet motors,brushless DC motors.Applications. **8 Hours**

UNIT – 3 and 4
LOSSES AND EFFICIENCY- Losses in DC machines, power flow diagram, efficiency, condition for maximum efficiency.
TESTING OF DC MACHINES- Direct & indirect methods of testing of DC machines-Brake test, Swinburn's test, Hopkinson's test, Retardation test , Field's test, merits and demerits of tests.
10 Hours

PART - B

UNIT - 5
SYNCHRONOUS MACHINES- Basic principle of operation, construction of salient & non-salient pole synchronous machines, generated EMF, effect of distribution and chording of winding, harmonics-causes, reduction and elimination. Armature reaction, synchronous reactance, leakage reactance, phasor diagram of non salient type alternator. **5 Hours**

UNIT - 6
VOLTAGE REGULATION: Voltage regulation by EMF, MMF, ZPF & ASA method.Schort circuit ratio and its importance.Two reaction theory-direct and quadrature axis reactances,phasor diagram.Slip test and regulation. **8 Hours**

UNIT - 7
Synchronizing to infinite bus bars, parallel operation of alternators. Operating characteristics, power angle characteristics excluding armature resistance, operation for fixed input and variable excitation, power flow equations including armature resistance, capability curves of synchronous generators. **6 Hours**
UNIT - 8
SYNCHRONOUS MOTOR: Principle of operation, phasor diagrams, torque and torque angle, Blondal diagram, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condensor, hunting and damping. Methods of starting synchronous motors. 7 Hours

TEXT BOOKS:
5. **Electrical machinery,** P.S Bhimbra, Khanna Publishers
6. **Electrical machines,** DP Kothari, I.J.Nagarath, TMH, 4th edition, 2010.
7. **Electric Machines,** Mulukuntla S.Sarma, Mukesh K.Pathak, Cengage Learning, First edition,2009.

REFERENCE BOOKS:
3. **Performance & Design of Alternating Current machines**, M. G. Say, CBS publishers,3rd Edition,2002.
4. **The Performance & Design of DC machines** A.E Clayton & N.N.Hancock CBS Publication,3rd Edition,2004.
3. **Electrical Machines**,Ashfaq Hussain, Dhanpat Rai Publications.

10EE55 MODERN CONTROL THEORY

Subject Code	:	10EE55	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT – 1 and 2

STATE VARIABLE ANALYSIS AND DESIGN: Introduction, concept of state, state variables and state model, state modeling of linear systems, linearization of state equations. State space representation using physical variables, phase variables & canonical variables. **10 Hours**

UNIT - 3

Derivation of transfer function from state model, diagolization, Eigen values, Eigen vectors, generalized Eigen vectors. **6 Hours**

UNIT - 4

Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Cayley-Hamilton method, concept of controllability & observability, methods of determining the same. **10 Hours**

PART - B

UNIT - 5

POLE PLACEMENT TECHNIQUES: stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement, state regulator design, and design of state observer, Controllers- P, PI, PID. **10 Hours**

UNIT - 6

Non-linear systems: Introduction, behavior of non-linear system, common physical non linearity-saturation, friction, backlash, dead zone, relay, multi variable non-linearity.**3 Hours**

UNIT - 7

Phase plane method, singular points, stability of nonlinear system, limit cycles, construction of phase trajectories.**7 Hours**

UNIT - 8

Liapunov stability criteria, Liapunov functions, direct method of Liapunov & the linear system, Hurwitz criterion & Liapunov's direct method, construction of Liapunov functions for nonlinear system by Krasvskii's method. **6 Hours**

TEXT BOOKS:

1. **Digital control & state variable methods,** M. Gopal , 3rd Edition, TMH ,2008
2. **Control system Engineering,** I. J. Nagarath & M. Gopal, New Age International (P) Ltd, 3rd edition.

REFERENCE BOOKS:

1. **State Space Analysis of Control Systems,** Katsuhiko Ogata -PHI
2. **Automatic Control Systems,** Benjamin C. Kuo & Farid Golnaraghi, 8th edition, John Wiley & Sons 2009.
3. **Modern Control Engineering,** Katsuhiko Ogata, PHI,5th Edition, 2010
4. **Modern Control Engineering,** D. Roy Choudary,PHI, 4th Reprint,2009.
5. **Modern control systems**, Dorf & Bishop- Pearson education, 11th Edition 2008

10EE56 LINEAR IC'S AND APPLICATIONS

Subject Code	:	10EE56	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

OP-AMPS AS AC AMPLIFIER: Capacitor coupled voltage follower, high Z_{in} capacitor coupled voltage follower, capacitor coupled non-inverting amplifier, high Z_{in} capacitor coupled non-inverting amplifier, capacitor coupled inverting amplifier, setting upper cut off frequency, capacitor coupled difference amplifier, and use of single polarity supply.**6 Hours**

UNIT 2

OP-AMPS FREQUENCY RESPONSE AND COMPENSATION: Op amp circuits stability, frequency and phase response, frequency compensating methods ,manufacturer's recommended compensation, op-amp circuit band width, slew rate effects,stray capacitance effects, load capacitance effects, Z_{in} mode compensation, circuit stability precautions.**7 Hours**

UNIT - 3

SIGNAL PROCESSING CIRCUITS: Precision half wave & full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample &hold circuit. DAC and ADC (Flash and successive approximations) 7 **Hours**

UNIT - 4

OPAMPS AND NONLINEAR CIRCUITS: Op-amps in switching circuits, zero crossing detectors, inverting Schmitt trigger circuits, non-inverting Schmitt circuits, astable multivibrator, and monostable multivibrator. **6 Hours**

PART - B

UNIT - 5

SIGNAL GENERATOR: Triangular/rectangular wave generator, waveform generator design, phase shift oscillator, oscillator amplitude stabilization, Wein bridge oscillator, signal generators, output controllers **7 Hours**

UNIT - 6

ACTIVE FILTERS: First and second order high pass and low pass filters, band pass filter, band stop filter. **7 Hours**

UNIT - 7

SPECIALIZED IC APPLICATIONS: Universal active filter, switched capacitor filter, phase locked loops, power amplifiers. **6 Hours**

UNIT - 8

DC VOLTAGE REGULATORS: Voltage regulators basics, voltage follower regulator, adjustable output regulator, precision voltage regulators, and integrated circuit voltage regulators. **6 Hours**

TEXT BOOKS:

1. **Operational amplifiers and linear IC's,** David A Bell, Oxford University Press, 2010.
2. **Operational amplifiers and linear IC's,** Ramakanth A Gayakwad, PHI, 4th edition,2009.
3. **Linear integrated circuits,**S.P.Bali,TMH,2009**.**

REFERENCE BOOKS:

2. **Op Amps and Linear Integrated Circuits-Concepts and Applications,** James M.Fiore,Cengage Learing,2009.
2. O**p Amps, Design, Applications and Trouble Shooting**,Elsevier,2nd Edition.
3. **Operational amplifiers and linear IC's,** Stanley William D, – 4th edition, Pearson Education**.**
8. **Linear Integrated Circuits- Analysis,Design and Applications,**B.Somanathan Nair, Wiley India, First,Edition, 2009.

10EEL57 MEASUREMENTS AND CIRCUIT SIMULATION LABORATORY

Subject Code	:	**10EEL57**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurement of cable insulation and earth resistance using Meggar
3. Measurement of inductance using Maxwell Inductance-Capacitance bridge & determination of Q-factor
4. Measurement of capacitance using De-Sauty's bridge & determination of dissipation factor.
5. M easurement of active and reactive power in balanced 3-phase circuit using two-watt meter method.
6. Adjustment & calibration of 1-phase energy meter
7. Determination of ratio & phase angle error in CT.
8. a) Inverting, non-inverting & scale changing of signals using op -amps
   b) RC phase shift oscillator using op amps (Both using simulation package)
9. RC coupled amplifier-frequency response for variation of bias & coupling using simulation package
10. Rectifier circuits-Bridge rectifier, diode clipping & clamping circuits using simulation package.
11. Schmitt –trigger- inverting and non-inverting.

13 Signal generator- triangular, saw tooth and rectangular wave generation

Note: All experiments, except 5,6 and 7, are to be carried out by using components and verify the result by using a simulation package.

10EEL58 TRANSFORMERS AND INDUCTION MACHINES LABORATORY

Subject Code	:	**10EEL58**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

2. (a)Predetermination of efficiency and regulation by Open Circuit and Short circuit tests on single -phase transformer.

(b)Calculation of parameters of equivalent circuit from the readings of the tests and determination of efficiency and regulation from the equivalent circuit to correlate results obtained earlier.

3 Sumpner's test on similar transformers and determination of combined and individual transformer efficiency.

3.Parallel operation of two dissimilar (different kVA) single-phase transformers and determination of load sharing and analytical verification given the Open Circuit and Short circuit tests details.

4.Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load.

5. Scott connection with balanced and unbalanced resistive loads.

6. Load test on 3-phase induction motor- and plot of Torque versus speed, output hp versus efficiency, power factor and slip.

7. Predetermination of performance of 3-phase induction Motor from the Circle diagram.

8. (a)Determination of parameters of the equivalent circuit of a 3-phase Induction Motor by conducting NO load and Blocked rotor tests.

(b)Determination of performance quantities of the induction motor from the equivalent circuit to correlate the results obtained from the load test or circle diagram.

9. Speed control of 3-phase induction motor by varying rotor resistance.
10. Load test on- induction generator.
11. Load test on single- phase induction motor.

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FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

VI SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE61	Power System Analysis and Stability	E&EE	4	-	3	25	100	125
2	10EE62	Switchgear & Protection	E&EE	4	-	3	25	100	125
3	10EE63	Electrical Machine Design	E&EE	4	-	3	25	100	125
4	10EE64	Digital Signal Processing	E&EE	4	-	3	25	100	125
5	10EE65	CAED (Computer Aided Electrical Drawing)	E&EE	1	3	3	25	100	125
6	10EE66X	Elective-I (Group A)	E&EE	4	-	3	25	100	125
7	10EEL67	D.C. Machines and Synchronous Machines Laboratory	E&EE	-	3	3	25	50	75
8	10EEL68	Control Systems Laboratory	E&EE	-	3	3	25	50	75
Total				21	09	24	200	700	900

Elective-I (Group A)

10EE661- Operation Research
10EE662 - Advanced Power Electronics
10EE663 – Fuzzy Logic
10EE664 - Object Oriented Programming using C++
10EE665 - Embedded Systems
10EE666 – Electri cal Engineering Materials.

10EE61 POWER SYSTEM ANALYSIS AND STABILITY

Subject Code	:	**10EE61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REPRESENTATION OF POWER SYSTEM COMPONENTS: Circuit models of Transmission line, Synchronous machines, Transformers and load. Single line diagram, impedance and reactance diagrams. Per unit system, per unit impedance diagram of power system. **8 Hours**

UNIT - 2

SYMMETRICAL 3 - PHASE FAULTS: Analysis of Synchronous machines and Power system. Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines with and without load . **6 Hours**

UNIT - 3 & 4

SYMMETRICAL COMPONENTS: Introduction, analysis of unbalanced load against balanced Three-phase supply, neutral shift. Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components**,** Analysis of balanced and unbalanced loads against unbalanced 3 phase supply, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems. Measurement of sequence impedance of synchronous generator.

12 Hours

Part - B

UNIT - 5 & 6

UNSYMMETRICAL FAULTS: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system. **14 Hours**

UNIT - 7

STABILITY STUDIES: Introduction**,** Steady state and transient stability. Rotor dynamics and the swing equation. Equal area criterion for transient stability evaluation and its applications. **8 Hours**

UNIT – 8

UNBALANCED OPERATION OF THREE PHASE INDUCTION MOTRORS: Analysis of three phase induction motor with one line open., Analysis of three phase induction motor with unbalanced voltage. **4 Hours**

TEXT BOOKS:

1. **Elements of Power System Analysis**, W.D.Stevenson, TMH,4th Edition
2. **Modern Power System Analysis**,.I. J. Nagrath and D.P.Kothari- TMH, 3rd Edition,2003.
3. **Symmetrical Components and Short Circuit Studies,** Dr.P.N.Reddy, Khanna Publishers

REFERENCE BOOKS:

1. **Power System Analysis**, Hadi Sadat, TMH,2nd Edition.
2. **Power system Analysis**, R.Bergen, and Vijay Vittal, Pearson publications, 2nd edition, 2006.
3. **Computer Aided Power system analysis**, G.L., Kusic, PHI.Indian Edition, 2010 .
4. **Power System Analysis**,W.D.Stevenson & Grainger,TMH, First Edition, 2003.

10EE62 SWITCHGEAR & PROTECTION

Subject Code	:	**10EE62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SWITCHES AND FUSES: Introduction, energy management of power system, definition of switchgear, switches - isolating, load breaking and earthing. Introduction to fuse**,** fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liquid fuse, Application of fuse

4 Hours

UNIT - 2

PRINCIPLES OF CIRCUIT BREAKERS: Introduction, requirement of a circuit breakers, difference between an isolator and circuit breaker, basic principle of operation of a circuit breaker, phenomena of arc, properties of arc, initiation and maintenance of arc, arc interruption theories - slepian's theory and energy balance theory**,** Restriking voltage, recovery voltage, Rate of rise of Restriking voltage, DC circuit breaking, AC circuit breaking, current chopping, capacitance switching, resistance switching, Rating of Circuit breakers.

10 Hours

UNIT - 3 & 4

CIRCUITS BREAKERS: Air Circuit breakers – Air break and Air blast Cir cuit breakers, oil Circuit breakers - Single break, double break, minimum OCB, SF_6 breaker - Preparation of SF_6 gas, Puffer and non Puffer type of SF_6 breakers. Vacuum circuit breakers - principle of operation and constructional details. Advantages and disadvantages of different types of Circuit breakers, Testing of Circuit breakers, Unit testing, synthetic testing, substitution test, compensation test and capacitance test.

LIGHTNING ARRESTERS: Causes of over voltages – internal and external, li ghtning, working principle of different types of lightning arresters. Shield wires.

12 Hours

PART - B

UNIT - 5

PROTECTIVE RELAYING: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

INDUCTION TYPE RELAY: Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay – Principle of operation, percentage differential relay, bias characteristics, distance relay – Three stepped distance protection, Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay – block diagram approach.

10 Hours

UNIT - 7 & 8

PROTECTION SCHEMES: Generator Protection - Merz price protection, prime mover faults, stator and rotor faults, protection against abnormal conditions – unbalanced loading, loss of excitation, over sp eeding. Transformer Protection - Differential protection, differential relay with harmonic restraint, Inter turn faults Induction motor protection - protection against electrical faults such as phase fault, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load. **12 Hours**

TEXT BOOKS: ,

4. **Switchgear & Protection** Sunil S.Rao,,Khanna Publishers,13th Edition,2008.
5. **Power System Protection & Switchgear,** Badriram & Viswa Kharma ,TMH,1st edition, 2001.
6. **Fundamentals of Power System protection,** Y G. Painthankar and S R Bhide,PHI, 2009.

REFERENCE BOOKS:

2. **A Course in Electrical Power,** Soni, Gupta & Bhatnagar, Dhanapatirai.
2. Power System Protection & Switchgear, Ravindarnath & Chandra -New age Publications. **3 Electrical Power,** Dr S. L. Uppal, Khanna Publishers.
4. **Handbook of Switchgears**, BHEL,TMH, 5th reprint,2008.

10EE63 ELECTRICAL MACHINE DESIGN

Subject Code	:	**10EE63**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

PRINCIPLES OF ELECTRICAL MACHINE DESIGN: Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.
4 Hours

UNIT - 2

DESIGN OF DC MACHINES: Output equation, choice of specific loadings and choice of number of poles, design of Main dimensions of the DC machines, Design of armature slot dimensions, commutator and brushes, magnetic circuit - estimation of ampere turns, design of yoke and poles- main and inter poles, field windings – shunt, series and inter poles. **10 Hours**

UNIT - 3 & 4

DESIGN OF TRANSFORMERS (Single phase and three phase): Output equation for single phase and three phase transformers, choice of specific loadings, expression for volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and conductor cross sectional area of Primary and secondary windings, estimation of no load current, expression for leakage reactance and voltage regulation. Design of tank and cooling tubes (round and rectangular) **12 Hours**

PART - B

UNIT - 5 & 6

DESIGN OF INDUCTION MOTORS: Output equation, Choice of specific loadings, main dimensions of three phase induction motor, Stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, design of Rotor bars and end ring, design of Slip ring induction motor, estimation of No load current and leakage reactance, and circle diagram. 1**4 Hours**

UNIT - 7 & 8

DESIGN OF SYNCHRONOUS MACHINES: Output equation, Choice of specific loadings, short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non salient pole synchronous machines. Design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, design of the field winding, and design of rotor of non-salient pole machine . **12 Hours**

TEXT BOOKS:

1. **A Course In Electrical Machine Design**, A.K.Sawhney,Dhanpatt Rai & Sons
2. **Design Of Electrical Machines**, V. N. Mittle, 4th edition

REFERENCE BOOKS:

1. **Performance And Design Of AC Machine**s, M.G.Say,CBS Publishers and Distributors Pvt.Ltd.
2. **Design Data Handbook,** A.Shanmugasundarm, G,Gangadharan,R.Palani,Wiley Eastern Ltd.

10EE64 DIGITAL SIGNAL PROCESSING

Subject Code	:	10EE64	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 and 2
Discrete Fourier Transforms: Definitions, properties-linearity, shift, symmetry etc, circular convolution – periodic convolution, use of tabular arrays, circular arrays, stock hams's method, linear convolution – two finite duration sequence, one finite & one infinite duration, overlap add and save methods**.**
14 Hours

UNIT – 3 and 4
FAST FOURIER TRANSFORMS ALGORITHMS: Introduction, decimation in time algorithm, first decomposition, number of computations, continuation of decomposition, number of multiplications, computational efficiency, decimation in frequency algorithms, algorithm, inverse decimation in time and inverse decimation in frequency algorithms, decomposition for a composite number N=9. **12 Hours**
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PART - B

UNIT – 5 AND 6
DESIGN OF IIR DIGITAL FILTERS: Introduction, impulse invariant & bilinear transformations, all pole analog filters- Butterworth & chebyshev, design of digital Butterworth & chebyshev, frequency transformations **12 Hours**

UNIT 7
DESIGN OF FIR DIGITAL FILTERS: Introduction, windowing, rectangular, modified rectangular, Hamming, Hanning, blackman window(excluding Kaiser window), frequency sampling techniques.
`8 Hours

UNIT - 8
REALIZATION OF DIGITAL SYSTEMS: Introduction, block diagrams and SFGs, realization of IIR systems- direct form, cascaded, parallel form, ladder structures for equal degree polynomial, realization of FIR systems – direct form, cascade form, linear pha se realization. **06 Hours**

TEXT BOOKS:

3. **Digital Signal Processing Principle, Algorithm & application**, Proakis, Pearson,4th education, 2009.

4. **Digital Signal Processing ,** Sanjeet. K. Mitra ,TMH,3rd Edition,2009.

REFERENCE BOOKS:

5. **Introduction To Digital Signal Processing**, Johnny R. Johnson,PHI,2009
6. **Discrete Time Signal Processing** ,Openheim, pearson 2nd Edition 2009
7. **Digital Signal Processing,** S.Salivahanan,A. Vallaraj,C.Gnanapriya,TMH,2nd Edition,2010.
8. **Digital Signal Processing**, Ifeachor Emmauel- Pearson education,2nd Edition,2006.
5. **Fundamentals of Digital Signal Processing,**Ludeman,John Wiley, 3rd Edition,2008

10EE65 CAED (COMPUTER AIDED ELECTRICAL DRAWING)

Subject Code	:	**10EE65**	**IA Marks**	:	25
No. of Lecture and Practice Hrs./ Week	:	01Hour Lecture + 03 Hours Practical	Exam Hours	:	03
Total No. of Lecture and Practice Hrs.	:	52	Exam Marks	:	100

PART - A

1. Winding Diagrams

(a) Developed winding diagrams of D.C. machines – Simpl ex and multiplex double layer Lap and Wave windings.

(b) Developed winding diagrams of A.C. machines

(i) Integral and Fractional slot double layer Lap and Wave windings.

(ii) Single layer windings – Un-bifurcated 2 and 3 tier windings, mush windings, Bifurcated 2 and 3 tier windings.

2. Single line diagrams of generating stations and substations. **20 Hours**

PART - B

3. Electrical machine assembly drawing using designs data or sketches or both.

(a) Transformers - sectional views of single and three phase core and shell type transformers.

(b) D.C. machine - sectional views of yoke, field system, armature and commutator dealt Separately.

(c) Alternator – sectional views of stator and rotor dealt separately. **32 Hours**

TEXT BOOKS:

1.**Performance & Design of Alternating Current machines**, M. G. Say, CBS publishers,3rd Edition,2002.
2.**The Performance & Design of DC machines** A.E Clayton & N.N.Hancock CBS Publication,3rd Edition,2004.

REFERENCE BOOKS:

1**. Manuals of Auto - CAD**

Elective-I (Group A)

10EE661 OPERATION RESEARCH

Subject Code	:	**10EE661**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

Unit – 1
Linear Programming, Introduction, formulation of linear programming problem, Standard and matrix from, graphical solution, simplex method, computational procedure, Big-M method, Two-phase simplex method. **8 Hours**

Unit – 2
Special cases, Degeneracy, alternative optimal solutions, unbounded solutions, Non-existing optimal solutions. Duality in LPP, primal-dual relation, Formulation of dual problem, primal-dual optimal solution, limitations of LPP. 8 **Hours**

Unit – 3
ADVANCED LINEAR PROGRAMMING: Revised simplex method,dual simplex method,parametric programming. **5 Hours**

Unit – 4
Assignment problems, Introduction, Formulation, Hungarian method of solving assignment problem, special cases, Traveling salesman problem. **5 Hours**

PART – B

Unit – 5
TRANSPORTATION PROBLEMS: Basic feasible solution by different methods, fixing optimal solutions-stepping stone methode, MODI method, degenerasity. **7 Hours**
Unit – 6
GAMES THEORY: Introduction to optimal strategies, solution of 2 x 2, 2 x n, m x 2 games. Concept of dominance, Graphical method of solving. Sequencing problems, n-jobs and one machine. Heuristic problem solving (Continued) n-jobs and two machines, n-jobs and three machines, two jobs and m machines. N-jobs and m-machines. **7 Hours**

Unit – 7
PERT-CPM TECHNICS: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic modes, prediction of date of completion, crashing of a simple networks, resource leveling by network techniques. 6 **Hours**

Unit – 8: Replacement theory, Introduction, Economic life of equipments, Replacement considering both the cases with and without tie value of money, group replacement policy. **6 Hours**

TEXT BOOK:

1.**Fundamentals of operations research** – Ackoff, R.L. and Sasieni, M.W. Wiley eastern limi ted, New Delhi.
2.**Opretions Research Applications and Algorithms,** Wayne L. Winston,Cengage Learning,4th Edition,2009.
3.**Operations Research** – Bronson, R- Schaum's outline series, Mc Graw Hil l International, 2nd Edition.
4.**Introduction to operations Research**,Gillet, B.e., TMH,1979.
5. **Introduction to operations Research** – Hillier, F.S. and Lieberman, G.J, TMH, 8 th Edition, 2009

6. **Operational Research,** S.D sharma

10EE662 ADVANCED POWER ELECTRONICS

Subject Code	:	**10EE662**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2
DC-DC SWITCHED MODE CONVERTERS: Topologies, Buck, boost, buck-boost, and Cuk converters, Full Bridge DC-DC converter-detailed theory, working principles, modes of operation, with detailed circuits and wave forms, applications, merits and demerits. **16 Hours**

UNIT - 3 & 4
DC-AC SWITCHED MODE INVERTERS: Single-phase inverters, three phase inverters. SPWM inverter, detailed theory, working principles, modes of operation with circuit analysis, applications, merits and demerits, problems based on input output voltage relationship.

10 Hours

PART - B

UNIT - 5
RESONANT CONVERTERS: Zero voltage and zero current switching, resonant switch converters, and comparison with hard switching, switching locus diagrams, and working principle. **8 Hours**

UNIT - 6
HIGH FREQUENCY INDUCTOR AND TRANSFORMERS: Design principles, definitions, comparison with conventional design and problems. Design of Flyback transformer.
08 Hours

UNIT - 7 & 8

POWER SUPPLIES: Introduction, DC power supplies: fly back converter, forward converter, push-pull converter, half bridge converter, full bridge converter, AC power supplies: switched mode ac power supplies, resonant ac power supplies, bidirectional ac power supplies. **10 Hours**

TEXT BOOKS:

4. **Power Electronics**, Daniel.W.Hart, TMH, First Edition,2010.
5. **Power Electronics - converters, application & design**, Mohan N, Undeland T.M., Robins, W.P,John Wiley ,3rd Edition 2008
6. **Power Electronics-Circuits, Devices, Applications,** Rashid M.H., PHI, 3rd Edition, 2008.

REFERANCE BOOKS:

1.**Power Electronics Essentials and Applications**,L.Umanand, Wiely India Pvt Ltd,Reprint,2010
2.**Modern Power Electronics and A.C. Drives,** Bose B.K, PHI, 2009.
3. **Digital Power Electronics And Applications,** Muhammad Rashid, Elsevier , first edition, 2005.
4. **Power Electronics,Devices,Circuits and Industrial Applications**,V.R.Moorthi,Oxford,7th impression,2009.

10EE663 FUZZY LOGIC

Subject Code	:	10EE663	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
THE MATHEMATICS OF FUZZY CONTROL: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle. **8 Hours**

UNIT - 2, 3 and 4
THEORY OF APPROXIMATE REASONING: Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference.
NON-LINEAR FUZZY CONTROL: FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC. **18 Hours**

PART - B

UNIT - 5 and 6
FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, aircraft landing Control etc).
14 Hours

UNIT - 7 and 8
ADAPTIVE FUZZY CONTROL: Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller. **12 Hours**

TEXT BOOKS:

3. **Fuzzy Logic With Engineering Applications-** Timoty Ross,John Wiley, Second Edition, 2009.
4. **Fuzzy Sets Uncertainty and Information**- G. J. Klir and T. A. Folger, PHI IEEE, 2009.

REFERENCE BOOKS:

3. **An Introduction to Fuzzy Control**, D. Diankar, H. Hellendoom and M. Reinfrank ,Narosa Publishers India, 1996.
4. **Essentials of Fuzzy Modeling and Control**, R. R. Yaser and D. P. Filer,John Wiley, 2007.
3. **Fuzzy Logic Intelligence Control And Information,** Yen- Pearson education,First Edition,2006.

10EE664 OBJECT ORIENTED PROGRAMMING USING C ++

Subject Code	:	**10EE664**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING: Review of Procedure Oriented Programming, Basic concepts of Object Oriented Programming – Object, Class, Encapsulation, Inheritance, Polymorphism; Benefits of OOPs, Applications of OOP's. **4 Hours**

UNIT - 2
THE BASIC LANGUAGE C++: A comparison of C and C++, Structure of C++ program with Class, Preprocessor directives, C++ Statements – Input/Out put, Comments, Tokens, Keywords, Identifiers, Constants, Data types – string, pointer, reference, boole, enumeration, array, complex number; typedef names, type compatibility, type conversion, qualifier – const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions – New and Delete. **6 Hours**

UNIT - 3
FUNCTIONS IN C++: Introduction, The main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, const Arguments, Function Overloading, Friend and Virtual functions, pointer to functions. **8 hours**

UNIT - 4
CLASSES AND OBJECTS: Introduction – declaration and definition of a Cl ass, defining member functions, C++ program with a Class, Making an outside function Inline, Nesting of member functions, Arrays within a class, Static data members, static member functions, Objects – global & local objects, scope & lifetime, memory allocation for objects, dynamically allocated objects, pointers to objects, arrays of objects, function arguments with objects, returning objects; const member functions. **8 Hours**

PART - B

UNIT - 5
CONSTRUCTORS AND DESTRUCTORS: Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. **4 Hours**

UNIT - 6
OPERATOR OVERLOADING AND TYPE CONVERSION: Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using Friends, Rules for overloading operators, overloading a comma operator, overloading the output operator , Type conversion. **7 Hours**

UNIT - 7
INHERITANCE: Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. **6 Hours**

UNIT - 8
POINTER, VIRTUAL FUNCTIONS AND POLYMORPHISM: Introduction, Pointers, Pointers to Objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions.

MANAGING CONSOLE I/O AND FILE I/O: C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Methods of Opening and Closing a File, Examples of Opening file using constructor open(), file modes (simple programming exercises). **9 Hours**

TEXT BOOKS:

4. **Object Oriented Programming with C++**- Balagurusamy, E, TMH,4th edition, 2008.
5. **C++, The Complete Reference -**Herbert Schildt, , TMH, 4th edition
6. **Object Oriented Programming with C++**, Farrell,Cengage Learning,First Edition,2008.

REFERENCE BOOKS:

2. **The C++ programming language,**Bjarne Stroustrup, Pearson Education, 3rd edition,2006.
2. **Objected oriented programming with C++,**Bhave, Pearson Education, First Edition,2006.

10EE665 EMBEDDED SYSTEMS

Subject Code	:	**10EE665**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

CONCEPT OF EMBEDDED SYSTEM DESIGN: Components, classification, skills required.Embedded Micro controller cores: Architecture of 6808 and 6811.Embedded Memories ROM variants, RAM.Applications of embedded system: Examples of Embedded systems SOC for cellless bar code scanner. **10 Hours**

UNIT - 3

TECHNOLOGICAL ASPECTS OF EMBEDDED SYSTEM: Interfacing between analog and digital blocks, Signal conditioning, digital signal processing, DAC & ADC interfacing, Sample & hold, multiplexer interface Internal ADC interfacing (excluding 6805 & 6812), Data Acquisition System and Signal conditioning using DSP. **10 Hours**

UNIT - 4

DESIGN TRADE OFFS DUE TO PROCESS INCOMPATIBILITY, THERMAL CONSIDERATIONS: Issues in embedded system design. Design challenge, design technology, trade offs. Thermal considerations. **6Hours**

PART - B

UNIT - 5 & 6

Software aspects of Embedded Systems, real time programming Languages, operating systems. Programming concepts and embedded programming in C.Round Robin, Round Robin with interrupts, function queue-scheduling architecture, Real time OS architecture, selecting architecture. Introduction to RTOS. **12 Hours**

UNIT - 7 & 8

Subsystem interfacing with external systems user interfacing, Serial I/O devices, Parallel port interfaces: Input switches, Key boards and Memory interfacing.

Case study: Embedded velocity PID controller, PI controller with a PWM actuator. **14Hours**

TEXT BOOKS:

4. **Embedded Microcomputer systems: Real time interfacing-** Valvano, J.W, Cengage Learning,2nd Edition 5th Indian reprint,2009
5. **The Art of Designing Embedded systems**- Ganssle, Jack, Newness

6. **Embedded System, Architecture, Programming and Design-** Raj Kamal ,TMH,2nd Edition 2008.

REFERENCE BOOKS:

2. **A Unified Hardware/Software Introduction-**Frank Vahid/Tony Givargis, Wiley student edition 2002
2. **Motorola and Intel Manuals**
3. **Embeded Software Premier,**Simon David, Addison Wessly 2000.

10EE666 ELECTRICAL ENGINEERING MATERIALS

Subject Code	:	**10EE666**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
CONDUCTING MATERIALS: Review of metallic conduction on the basis of free electron theory. Fermi-Dirac distribution – variation of conductivit y with temperature and composition, materials for electric resistors- general electric properties; material for brushes of electrical machines, lamp filaments, fuses and solder. **6 Hours**

UNIT - 2
SEMICONDUCTORS: Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors.
Magnetic materials: Classification of magnetic materials- origin of permanent magnetic dipoles, ferromagnetism, hard and soft magnetic materials, magneto materials used in electrical machines, instruments and relays. **10 Hours**

UNIT - 3 & 4
DIELECTRICS: Dielectric, polarization under static fields- electronic ionic and dipolar polarizations, behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials. Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss.
INSULATING MATERIALS: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bakelite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators. **10 Hours**

PART - B

UNIT - 5
MATERIALS FOR SPECIAL APPLICATIONS: Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts. **6 Hours**

UNIT - 6
MODERN TECHNIQUES FOR MATERIALS STUDIES: Optical microscopy, Electron microscopy, Photo electron spectroscopy, Atomic absorption spectroscopy, magnetic resonance, nuclear magnetic resonance, electron spin resonance and ferromagnetic resonance. **6 Hours**

UNIT - 7
Introduction Properties and Application of Piezoelectric materials, Eletrostrictive materials, Ferromagnetic materials, Magnetostrictive materials, Shape memory alloys, Electro archeological fluids, Magneto archeological fluids, Smart hydrogels. **6 Hours**

UNIT - 8
Ceramics: properties, application to conductors, insulators & capacitors
Plastics: Thermoplastics, rubber, thermostats, properties.

8Hours

TEXT BOOKS:

1. **An Introduction to Electrical Engineering-** Indulkar C.S. & Thiruvengadam. S,Chand publishers.
2. **Materials Science for Electrical and Electronic Engineers,** Ian P. Jones, Oxford University Press,Indian Edition, 2007.
3. **Electrical Engineering Materials,**Kapoor P L., Khanna Publications.
4. **Renewable Energy Sources and Emerging Technologies,** D.P. Kothari, K.C. Singal, Rakesh Ranjan. PHI, 2008.

REFERENCES:

1. **Electrical Properties of Materials**, L.Solymar, D.Walsh, 8^{th} Indian Edition- Oxford University Press Seventh Edition.
2. **MEMS and MOEMS Technology and Applications,** P.Rai-Choudhury (Editor), PHI,2009 .
3. **Introduction to Electronic Properties and Materials,**David Jiles,CRC Press,2^{nd} Ediyion.

10EEL 67 DC MACHINES AND SYNCHRONOUS MACHINES LABORATORY

Subject Code	:	**10EEL67**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Load characteristics of a D.C. shunt and compound generator - i) Short shunt-Cumulative and Differential (ii) Long shunt-Cumulative and Differential.
2. Load test on a DC motor- determination of speed-torque and HP-efficiency characteristics.
3. Swinburne's Test.
4. Hopkinson's Test.
5. Field's test on series motors.
6. Retardation test- electrical braking method.
7. Speed control of DC motor by armature voltage control and flux control.
8. Ward Leonard method of speed control of D.C. motor.
9. Voltage regulation of an alternator by EMF and MMF method.
10. Voltage regulation of an alternator by ZPF method.
11. Slip test and determination of regulation.
12. Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.
13. V and Inverted V curves of a synchronous motor.

15. Measurement of X_1, X_2 and X_o of a Synchronous generator and calculation of currents for an LG,LL or LLG fault.

10EEL68 CONTROL SYSTEMS LABORATORY

Subject Code	:	**10EEL68**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

3. Using MATLAB/SCILAB a) Simulation of a typical second order system and determination of step response and evaluation of time- domain specifications

b) Evaluation of the effect of additional poles and zeroes on time response of second order system
c) Evaluation of effect of pole location on stability
d) Effect of loop gain of a negative feedback system on stability

4. (a) To design a passive RC lead compensating network for the given specifications, viz., the maximum phase lead and the frequency at which it occurs and to obtain its frequency response.
   (b) To determine experimentally the transfer function of the lead compensating network.
7. (a) To design RC lag compensating network for the given specifications., viz., the maximum phase lag and the frequency at which it occurs, and to obtain its frequency response.
   (b) To determine experimentally the transfer function of the lag compensating network.
8. Experiment to draw the frequency response characteristic of a given lag- lead compensating network.
9. To study the effect of P, PI, PD and PID controller on the step response of a feedback control system (using control engineering trainer/process control simulator). Verify the same by simulation.
10. a) Experiment to draw the speed – torque characteri stic of a two - phase A.C. servomotor.
    b) Experiment to draw speed torque characteristic of a D.C. servomotor.
11. To determine experimentally the frequency response of a second -order system and evaluation of frequency domain specifications.

12. Using MATLAB/SCILAB

    a) Simulate a D. C. position control system and obtain its step response

    b) To verify the effect of the input wave form, loop gain system type on steady state errors.

    c) To perform a trade-off study for lead compensation

    d) To design a PI controller and study its effect on steady state error

13. Using MATLAB/SCILAB

    a) To examine the relationships between open-loop frequency response and stability , open loop frequency and closed loop transient response
    b) To study the effect of addition closed loop poles and zeroes on the closed loop transient response

14. Using MATLAB/SCILAB

    a) Effect of open loop and zeroes on root locus contour
    b) To estimate the effect of open loop gain on the transient response of closed loop system by using Root locus
    c) Comparative study of Bode, Nyquist and Root locus with respect to Stability.

11.Experiment to draw to syncro pair characteristics.

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FINAL SCHEME OF TEACHING & EXAMINATION and Syllabus - Dated 16th and 17th April 2010

VII SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE71	Computer Techniques in Power System Analysis	E&EE	4	-	3	25	100	125
2	10EE72	Electrical Power Utilization	E&EE	4	-	3	25	100	125
3	10EE73	High Voltage Engineering	E&EE	4	-	3	25	100	125
4	10EE74	Industrial Drives and Applications	E&EE	4	-	3	25	100	125
5	10EE75X	Elective-II (Group B)	E&EE	4	-	3	25	100	125
6	10EE76X	Elective-III (Group C)	E&EE	4	-	3	25	100	125
7	10EEL77	Relay and High Voltage Laboratory	E&EE	-	3	3	25	50	75
8	10EEL78	Power System Simulation Laboratory	E&EE	-	3	3	25	50	75
Total				24	06	24	200	700	900

Elective-II (Group B)
10EE751 - HVDC Transmission
10EE752 - Programmable Logic Controllers
10EE753 - Artificial Neural Network
10EE754 - Operating System
10EE755 - Digital System with VHDL
10EE756 -Testing and Commissioning of Electrical Equipment

Elective-III (Group C)
10EE761 - Power System Planning
10EE762 - Computer Control of Electrical Drives
10EE763 - Data Structure
10EE764 - VLSI Circuits and Design
10EE765 - Micro & Smart System Technology
10EE766 - Electromagnetic Compatibility

10EE71 COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject Code	:	**10EE71**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
NETWORK TOPOLOGY: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices – Element -node, Bus incidence, Tree-branch path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop, Primitive network – impedance form and admittance form. **6 Hours**

UNIT - 2
NETWORK MATRICES: Introduction, Formation of Y_{BUS} by method of inspection (including transformer off-nominal tap setting) and method of singular transformation ($Y_{BUS} = A^T yA$), Formation of Bus Impedance matrix by step by step building algorithm (without mutual coupling elements). **6 Hours**

UNIT - 3 & 4
LOAD FLOW STUDIES: Introduction, Power flow equations, Classification of buses, Operating constraints, Data for load flow, Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson's Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only). Algorithm for Fast Decoupled load flow method, Comparison of Load Flow Methods. **14 Hours**

PART - B

UNIT - 5 & 6
ECONOMIC OPERATION OF POWER SYSTEM: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling including generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative tech nique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm. **12 Hours**
UNIT - 7 & 8
TRANSIENT STABILITY STUDIES: Numerical solution of Swing Equation – Point-by-po int method, Modified Euler's method, Runge-Kutta method, Milne' s predictor corrector method. Representation of power system for transient stability studies – load representation, network performance equations. Solution techniques with flow charts. **14 Hours**

TEXT BOOKS:

3. **Computer Methods in Power System Analysis,** Stag, G. W., and EI-Abiad, A. H.- McGraw Hill International Student Edition. 1968
4. **Computer Techniques in Power System Analysis**, Pai, M. A- TMH, 2nd edition, 2006.

REFERENCE BOOKS:

5. **Modern Power System Analysis,** Nagrath, I. J., and Kothari, D. P, TMH,3rd Edition, 2003.
6. **Advanced Power System Analysis and Dynamics**, Singh, L. P, New Age International (P) Ltd, New Delhi, 2001.
7. **Computer Aided Power System Operations and Analysis**"- Dhar, R. N, TMH, 1984.
8. **Power System Analysis,** Haadi Sadat, TMH, 2nd Edition, 12th reprint, 2007

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment. **10 Hours**

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process. **6 Hours**

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy. **10 Hours**

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption. **20 Hours**

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption. **6 Hours**

TEXT BOOKS:

4. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
5. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
6. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	10EE73	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.
6Hours

UNIT - 2 & 3
BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in n on uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its signi ficance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown. **12 Hours**

UNIT - 4
GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop. **8 Hours**

Part - B

UNIT - 5
GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current. **6 Hours**

UNIT - 6
MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links. **10 Hours**

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods. **6 Hours**

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers. **4 Hours**

TEXT BOOKS:

4. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
5. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.

6. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE74 INDUSTRIAL DRIVES & APPLICATIONS

Subject Code	:	**10EE74**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

AN INTRODUCTION TO ELECTRICAL DRIVES & ITS DYNAMICS: Electrical drives. Advantages of electrical drives. Parts of electrical drives, choice of electrical drives, status of dc and ac drives, Dynamics of electrical drives, Fundamental torque equation, speed torque conventions and multiquadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization. **9 Hours**

UNIT - 2

SELECTION OF MOTOR POWER RATING: Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating. **5 Hours**

UNIT - 3 & 4

D C MOTOR DRIVES:

(a) Starting braking, transient analysis, single phase fully controlled rectifier, control of separately excited dc motor, Single-phase half controlled rectifier control of separately excited dc motor.

(b) Three phase fully controlled rectifier - control of separately excited dc motor, three phase half controlled rectifier - control of separately excited dc motor, multi-quadrant operation of separately excited dc motor fed from fully controlled rectifier. Control of dc series motor, chopper controlled dc drives-separately excited dc motor and series motor. **12 Hours**

PART - B

UNIT - 5

INDUCTION MOTOR DRIVES:

Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.

06 Hours

UNIT - 6

Stator voltage control:

Variable voltage and variable frequency control, voltage source inverter control, closed loop control, current source inverter control, , rotor resistance control, slip power recovery, speed control of single phase induction motors. **06 Hours**

UNIT - 7

SYNCHRONOUS MOTOR DRIVES: Operation from fixed frequency supply, synchronous motor variable speed drives, variable frequency control of multiple synchronous motors. Self-controlled synchronous motor drive employing load commutated thyrister inverter. **10 Hours**

UNIT - 8

INDUSTRIAL DRIVES: Rolling mill drives, cement mill drives, paper mill drives and textile mill drives.

4 Hours

TEXT BOOK:

2. **Fundamentals of Electrical Drives**, G.K Dubey , Narosa publishing house, 2nd Edition,2002.

REFERENCE BOOKS:

4. **Electrical Drives**, N.K De and P.K. Sen- PHI, 2009.
5. **A First Course On Electric Drives**, S.K Pillai-Wiley Eastern Ltd 1990.
6. **Power Electronics, Devices, Circuits and Industrial Applications**, V.R. Moorthi, "Oxford University Press, 2005.

4.**Electric Motor Drives,Modeling,Analysis and Control**, R.Krishnan,PHI,2008.

ELECTIVES-II(GROUP **B)**

10EE751 HVDC TRANSMISSION

Subject Code	:	**10EE751**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

GENERAL ASPECTS OF DC TRANSMISSION AND COMPARISON OF IT WITH AC TRANSMISSION: Historical sketch, constitution of EHV AC and DC links, Limitations and Advantages of AC and DC Transmission**. 12 Hours**

UNIT - 3 & 4

CONVERTER CIRCUITS: Valve Characteristics, Properties of converter circuits, assumptions, single phase, three phase converters, choice of best circuits for HV DC circuits. **12 Hours**

PART - B

UNIT - 5

ANALYSIS OF THE BRIDGE CONVERTER: Analysis with grid control but no over lap, Analysis with grid control and with over lap less than 60 deg, Analysis with overlap greater than 60 deg, complete characteristics of rectifier, Inversion. **10 Hours**

UNIT - 6 & 7

CONTROL OF HVDC CONVERTERS AND SYSTEMS: grid control, basic means of control, power reversal, limitations of manual control, constant current versus constant voltage, desired feature of control, actual control characteristics, constant -minimum -Ignition –angle control, constant –current control, constant –extinction –angle control, stability of c ontrol. **10 Hours**

UNIT - 8

PROTECTION: Introduction, DC reactor, voltage oscillations and valve dampers, current oscillations and anode dampers, DC line oscillations and line dampers, clear line faults and reenergizing the line. **8 Hours**

TEXT BOOKS:

5. **Direct current Transmission,** EW Kimbark,
6. **Power system stability and control,** Prabha Kundur, TMH, 9th reprint, 2007.
7. **High Voltage Power Transmission:The HVDC Options,** Jos Arrillaga, Y.H.Liu and Mevelle R Watson, Wiley Interscience.
8. **High Voltage D.C.Power Transmission System,** K.R.Padiyar,New Age International Publishers Ltd.

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	**10EE752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses. **7 Hours**

UNIT - 2

ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches

8 Hours

UNIT - 3 & 4

PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**. 10 Hours**

PART - B

UNIT - 5

INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay. **5 Hours**

UNIT - 6 & 7

Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters, timers with counters, sequencer. **12 Hours**

UNIT - 8

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications. **10 Hours**

Note: Programming is to be with reference to only Mitsubhish PLC

TEXT BOOKS:

3. **Programmable Logic controllers-**W Bolton, 5th edition, Elsevier- newness, 2009.
4. **Programmable logic controllers - principles and applications"-** John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

3. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
4. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE753 ARTIFICIAL NEURAL NETWORK

Subject Code	:	10EE753	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks. **7 Hours**

UNIT - 2
Supervised learning, single layer networks, perceptrons, linear separability, perceptron training algorithm, guarantees of success, modifications. **6 Hours**

UNIT - 3
Multiclass networks-I, multilevel discrimination, back propagation, setting parameter values, theoretical results. **6 Hours**

UNIT - 4
Accelerating learning process, application, Madaline adaptive multilayer networks. **7 Hours**

PART - B

UNIT - 5
Prediction networks, radial basis functions, polynomial networks, regularization, unsupervised learning, winner-take-all networks. **7 Hours**

UNIT - 6
Learning vector quantizing, counter propagation networks, adaptive resonance theorem, toplogically organized networks, distance based learning, recognition. **6 Hours**

UNIT - 7
Associative models, Hop Field networks, brain state networks, Boltzmann machines, hetero associations.
7 Hours

UNIT - 8
Optimization using Hopfiled networks, simulated annealing, random search, evolutionary computation.
6 Hours

TEXT BOOKS:

3. **Elements Of Artificial Neural Networks -**Kishan Mehrotra, C. K. Mohan, Sanjay Ranka, Penram, 1997
4. **Artificial Neural Networks**- R, Schalkoff, McGraw Hill, 1997.

REFERENCE BOOKS:

1.Neural Network Design- Hagan, Demuth and Beale Cengage,2nd Edition

2.Introduction To Artificial Neural Systems- J. Zurada, Jaico, 2003
3.Neural Networks -Haykins, PHI, 1999.
4. Artificial Neural Networks, B. Yegnanarayana ,PHI,2009 Edition.

10EE754 OPERATING SYSTEM

Subject Code	:	**10EE754**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART- A

UNIT – 1

INTRODUCTION TO OPERATING SYSTEM, SYSTEM STRUCTURES: What operating system do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **6 Hours**

UNIT - 2

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling. **7 Hours**

UNIT - 3

PROCESS SYNCHRONIZATION: Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **7 Hours**

UNIT - 4

DEADLOCKS: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **6 Hours**

PART – B

UNIT - 5

MEMORY MANAGEMENT: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.**7 Hours**

UNIT - 6

FILE SYSTEM, IMPLEMENTATION OF FILE SYSTEM: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **7 Hours**

UNIT - 7

SECONDARY STORAGE STRUCTURES, PROTECTION: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems. **6 Hours**

UNIT - 8

CASE STUDY: THE LINUX OPERATING SYSTEM: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication. **6 Hours**

TEXT BOOK:

1. **Operating System Principles –** Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley, 8th Edition, 2009.

REFERENCE BOOKS:

1. **Operating Systems: A Concept Based Approach** – D.M Dhamdhere, TMH, 2 nd Edition,2006.
2. **Operating Systems,** P.C.P. Bhatt, PHI, 2nd Edition, 2008.
3. **Operating Systems,**Harvey M Deital,Pearson Education, 3rd Edition.

10EE755 DIGITAL SYSTEM DESIGN WITH VHDL

Subject Code	:	**10EE755**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter. **10 Hours**

UNIT - 2
DESIGNING WITH PROGRAMMABLE LOGIC DEVICES: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PALs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner. **5 Hours**

UNIT - 3
DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider. **5 Hours**

UNIT - 4
DIGITAL DESIGN WITH SM CHARTS: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines. **6 Hours**

PART - B

UNIT - 5
DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 series FPGAs, Designing with FPGAs, Xilinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs.

6 Hours

UNIT - 6
FLOATING-POINT ARITHMETIC: Representation of floating-point numbers, Floating-point multiplication, Other floating-point operations. **6 Hours**

UNIT - 7
ADDITIONAL TOPICS IN VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multivalued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and TEXTIO. **7 Hours**

UNIT - 8
VHDL MODELS FOR MEMORIES AND BUSES: Static RAM, A simplified 486 bus model, interfacing memory to a microprocessor bus. **7 Hours**
TEXT BOOKS:

3. **Digital Systems Design Using VHDL,**Charles H. Roth. Jr, Cengage, 2010.
4. **Digital Electronics And Design With VHDL,** A. Pedroni, Volnet, Elsevier, 1st edition, 2008

REFERENCE BOOKS:

4. **Fundamentals of Digital Logic with VHDL Design,**Stephen Brwon & Zvonko Vranesic, TMH,2nd Edition 2006
5. **Digital Fundamentals using VHDL,**Floyd, Pearson Education, 2003,
6. **VHDL Primer**, J. Bhaskar , PHI, 2009.

10EE756 TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENT

Subject Code	:	**10EE756**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2
TRANSFORMERS:
a. Specifications: Power and distribution transformers as per BIS standards.

b. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

5 Hours

c. Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz & other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test.

7 Hours

d. Specific Tests: Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal &abnormal conditions.

3 Hours

UNIT - 3 & 4
SYNCHRONOUS MACHINES:
a. Specifications: As per BIS standards.

b. Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

c. Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

4 Hours

d. Performance tests: Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient & sub transient parameters, measurements of sequence impedances, capacitive reactance, and separation of losses, temperature rise test, and retardation tests.

6 Hours

e. Factory tests: Gap length, magnetic eccentricity, balancing vibrations, bearing performance.

2 Hours

PART - B

UNIT - 5, 6 & 7
INDUCTION MOTORS:
a. **Specifications** for different types of motors, Duty, I.P. protection.

2 Hours

b. Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of windings.

4 Hours

c. Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing.

5 Hours

Electrical Tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test, factory test and site test (in accordance with ISI code

4 Hours

d. Specific Tests: Performance & temperature raise tests, stray load losses, shaft alignment, and re-rating & special duty capability.

4 Hours

UNIT - 8
SWITCH GEAR & PROTECTIVE DEVICES: Standards, types, specification, installation, commissioning tests, maintenance schedule, type & routine tests.

6 Hours

TEXT BOOKS:

3. **Testing & Commissioning Of Electrical Equipment -**S. Rao,Khanna Publishers,2004
4. **Testing & Commissioning Of Electrical Equipment** -B .V. S. Rao, Media Promoters and Publication Pvt., Ltd.

REFERENCE BOOKS:

4. **Relevant Bureau of Indian Standards**
5. **A Handbook on Operation and Maintenance of Transformers-** H. N. S. Gowda, Published by H. N. S. Gowda,2006
6. **Handbook of SwitchGears,**BHEL, TMH,2005.
4 **J and P Transformer Book**,Elsevier Publication.

ELECTIVES-II (GROUP **C)**

10EE761 POWER SYSTEMPLANNING

Subject Code	:	**10EE761**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION OF POWER PLANNING, National and regional planning, structure of power system, planning tools, electricity regulation, Load forecasting, forecasting techniques, modeling. **8 Hours**

UNIT - 2 & 3
GENERATION PLANNING, Integrated power generation, co-generation / captive power, power pooling and power trading, transmission & distribution planning, power system economics, power sector finance, financial planning, private participation, rural electrification investment, concept of rational tariffs.
10 Hours

UNIT - 4
COMPUTER AIDED PLANNING: Wheeling, environmental effects, green house effect, technological impacts, insulation co-ordination, reactive compensation. **8 Hours**

PART - B

UNIT - 5 & 6
POWER SUPPLY RELIABILITY, reliability planning, system operation planning, load management, load prediction, reactive power balance, online power flow studies, test estimation, computerized management. Power system simulator**. 10 Hours**

UNIT - 7 & 8
Optimal Power system expansion planning, formulation of least cost optimization problem incorporating the capital, operating and maintenance cost of candidate plants of different types (thermal hydro nuclear non conventional etc), Optimization techniques for solution by programming. **16 Hours**

TEXT BOOK:
1. **Electrical Power System Planning,** A.S.Pabla, Macmillan India Ltd, 1998

10EE762 COMPUTER CONTROL OF ELECTRICAL DRIVES

Subject Code	:	**10EE762**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
REVIEW OF MICRO CONTROLLERS IN INDUSTRIAL DRIVES SYSTEM: Typical Micro controller's 8 bit 16 bit (only block diagram) Digital Data Acquisition system, voltage sensors, current sensors, frequency sensors and speed sensors. **4 Hours**

UNIT - 2
EVOLUTION OF POWER ELECTRONICS IN DRIVES: Power semiconductors devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications. Block diagram of power integrated circuit for D C motor drives. **4Hours**

UNIT - 3
A C MACHINE DRIVES: general classification and National Electrical Manufacturer Association (NEMA) classification, Speed control of Induction motors with variable voltage constant frequency, constant voltage variable frequency, (v/f) constant operation, drive operating regions. Variable stator current operation. Effect of Harmonics. **9 Hours**

UNIT - 4
SYNCHRONOUS MACHINE DRIVES: Wound field machine, comparison of Induction and wound field synchronous machines, Torque angle characteristics of salient pole synchronous machines, synchronous reluctance permanent magnet synchronous machines (SPM), variable reluctance machines (VRM). **8 Hours**

PART - B

UNIT - 5
PHASE CONTROLLED CONVERTERS: Converter controls, Linear firing angle control, cosine wave crossing control, phase locked Oscillator principle, Electrro magnetic Interference (EMI) and line power quality problems, cyclo converters, voltage fed converters, Rectifiers, Current fed converters.
7 Hours

UNIT - 6
PRINCIPLES OF SLIP POWER RECOVERY SCHEMES: Static Kramer's drive system, block schematic diagram, phasor diagram and limitations, Static Scherbins scheme system using D.C link converters with cyclo converter modes of operation, modified Scherbins Drive for variable source, constant frequency (VSCF) generation. **6 Hours**

UNIT - 7
PRINCIPLE OF VECTOR CONTROL OF A C DRIVES: Phasor diagram, digital Implementation block diagram, Flux vector estimation, indirect vector control block diagram with open loop flux control, synchronous motor control with compensation. **6 Hours**

UNIT - 8
EXPERT SYSTEM APPLICATION TO DRIVES (ONLY BLOCK DIAGRAM): Expert system shell, Design methodology, ES based P-I tuning of vector controlled drives system, Fuzzy logic control for speed controller in vector control drives,structure of fuzzy control in feedback system. **8 Hours**

TEXT BOOKS:

1. **Power Electronics & Motor Drives,**Bimal Bose, Elsevier 2006

2. **Modern Power Electronics & Drives,**Bimal K. Bose, Pearson Education 2003.

REFERENCE BOOK:

1. **Advanced Microprocessor and Interfacing,** Badri Ram, TMH, 1st Edition.

10EE763 DATA STRUCTURES

Subject Code	:	**10EE763**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

UNIT – 1

Design and Analysis of Algorithms: From problems to programs, Data Structures and Abstract Data types. **04 Hours**

UNIT – 2

Basic Data Type and Trees: Data types List, Implementation of lists, stacks Queues, Mappings, Stacks and recursive procedures. Basic terminology, ADT Tree, / Implementation of trees, Binary trees. **10 Hours**

UNIT – 3

Basic Operation on Sets: Introduction to sets an ADT with union intersection and difference, A Bit-vector implantation sets, A linked list implementation sets, The dictionary, simple dictionary implementation, the Hash table data structures, Estimating the efficiency of functions, Implementation of the mapping ADT, Priority Queues, Implementation of priority queues. **06 Hours**

UNIT – 4

Directed Graphs: Basic Definitions, Representation for directed graphs, the single source short path problems, Traversals of Directed Graphs, Directed A cyclic graphs, strong components. **06 Hours**

PART B

UNIT – 5

Sorting: The internal sorting model, simple sorting schemes, Quick sort Heapsort, Binsorting. **06 Hours**.

UNIT – 6

Algorithm analysis Techniques: Efficiency of algorithms, analysis of receive programs solving Recurrence Equations, A general solution for a large class of Recurrences. **06 Hours**

UNIT – 7

Algorithm Design Techniques: Divide and conquer algorithms, Dynamic programming, Greedy Algorithms, Back tracking, local search algorithms. **08 Hours**.

UNIT – 8

Data structures and Algorithm for external storage: A model of external computation, External sorting, sorting information in files, external search Trees. **08 Hours**

Text Book:

1.Data Structures and Algorithms, Alfred Aho, John E. Hopcroft and Jeffery D Ullaman, Pearson Education.

Reference Books:

3. **Introduction to Data structures and Algorithms with C+** by Gleen. W.Rowe, PHI Publications.
4. **Data structures using C & C++,** Langsam, Angenstein, Tenenbaum ,Pearson, 2nd edition,.
3. **Data Structures and Algorithm Analysis in C,** Weiss Mark Allen, Pearson Education,2nd Edition.

10EE764 VLSI CIRCUITS AND DESIGN

Subject Code	:	**10EE764**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
A REVIEW OF MICROELECTRONICS AND AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to integrated circuit technology. Introduction, VLSI technologies, MOS transistors, fabrication, thermal aspects, production of E-beam masks. **6 Hours**

UNIT - 2
BASIC ELECTRICAL PROPERTIES OF MOS AND BICMOS CIRCUIT: Drain to source current I_{ds} versus V_{ds} relationships-BICMOS latch up susceptibility. MOS transistor characteristics, figure of merit, pass transistor NMOS and COMS inverters, circuit model, latch up in CMOS circuits. **8 Hours**

UNIT - 3
MOS AND BICMOS CIRCUIT DESIGN PROCESSES: MOS layers, stick diagrams, design, symbolic diagrams. **8 Hours**

UNIT - 4
BASIC CIRCUIT CONCEPTS: Sheet resistance, capacitance layer inverter delays, wiring capacitance, choice of layers. **6 Hours**

PART - B

UNIT - 5
SCALING OF MOS CIRCUITS: Scaling model and scaling factors- Limitations due to current density. **8 Hours**

UNIT - 6
SUBSYSTEM DESIGN AND LAYOUT: Architectural issues, systems considerations. Examples of structural design, clocked sequential circuits. **8 Hours**

UNIT - 7
SUBSYSTEM DESIGN PROCESSES: General considerations, illustration of design process, observations. **4 Hours**

UNIT - 8
ILLUSTRATION OF THE DESIGN PROCESS: Observation on the design process, Regularity Design of an ALU subsystem. Design of 4-bit adder, implementation of ALU functions. **4 Hours**

TEXT BOOKS:

5. **Basic VLSI Design,** Douglas Pucknell &Eshragian**,** PHI, 3rd Edition, 2009.
6. **Fundamentals of Modern VLSI Devices,**Yuan Taun Tak H Ning Cambridge Press, South Asia Edition 2003,
7. **ModernVLSI Design,** Wayne wolf, Pearson Education Inc. 3rd edition, 2003.
8. **Introduction to CMOS VLSI Design-A Circuits and Systems Perspective,** Neil Weste,Pearson Education.3rd Edition.

10EE765 MICRO AND SMART SYSTEM TECHNOLOGY

Subject Code	:	10EE765	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION TO MICRO AND SMART SYSTEMS:
a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.
b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.**5 Hours**
UNIT - 2
MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS:
a) Definitions and salient features of sensors, actuators, and systems.
b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.
c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator
d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin. **8 Hours**
UNIT - 3
MICROMANUFACTURING AND MATERIAL PROCESSING:
a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.
b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.
c) Thick-film processing:
d) Smart material processing:
e) Processing of other materials: ceramics, polymers and metals
f) Emerging trends **7 Hours**
UNIT - 4
MODELING:
a) Scaling issues.
b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.
c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators. **6 Hours**

PART - B

UNIT - 5
COMPUTER-AIDED SIMULATION AND DESIGN:
Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software. **8 Hours**

UNIT - 6
ELECTRONICS, CIRCUITS AND CONTROL:
Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler. **8 Hours**

UNIT - 7
INTEGRATION AND PACKAGING OF MICROELECTRO MECHANICAL SYSTEMS:
Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples. **6 Hours**

UNIT - 8
CASE STUDIES: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

4 Hours

PART - C

UNIT - 9
Mini-projects and class-demonstrations (not for Examination)

9 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)
b) BEL pressure sensor
c) Thermal-cycler for PCR
d) Active control of a cantilever beam

TEXT BOOKS AND A CD-SUPPLEMENT:

2. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Hsu, TMH, 1st Edition.

REFERENCE BOOKS:

4. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
5. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

3 **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.

4 **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.

5. **Design and Development Methodologies, Smart Material Systems and MEMS**, V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.
6. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007

10EE766 ELECTROMAGNETIC COMPATIBILITY

Subject Code	:	**10EE766**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Designing of electromagnetic compatibility, EMC regulation, typical noise path, and use of network theory, method of noise coupling, miscellaneous noise sources, and method of eliminating interference. **8 Hours**

UNIT - 2 & 3
CABLING: Capacitive coupling, effect of shield on magnetic coupling, mutual inductance calculations, magnetic coupling between shield and inner conductor, shielding to prevent magnetic radiation, shielding a receptor against magnetic fields, shield transfer impedance, experimental data, example of selective shielding, co-axial cable versus shielded twisted pair braided shields, effect of pig tails, ribbon cable, electrically long cables. **10 Hours**

UNIT - 4
GROUNDING: Safety grounds, signal grounds, single point ground systems, hybrid grounds, multipoint ground systems, functional ground layout, practical low frequency grounding, hardware grounds, single ground reference for a circuit amplifier shields, grounding of cable shields, ground loops, low frequency analysis of common mode choke, high frequency analysis of common mode choke, differential amplifiers, shields grounding at high frequencies, guard shields guarded meters. **10 Hours**

PART - B

UNIT - 5
BALANCING AND FILTERING: Balancing, power supply decoupling, decoupling filters, amplifier decoupling driving capacitive loads, high frequency filtering, system bandwidth, and modulation and coding. **8 Hours**

UNIT - 6 & 7
SHIELDING: Near field and far fields, characteristic and wave impedance's shielding effectiveness, absorption loss, reflection loss, composite absorption and reflection loss, summary of shielding equation, shielding with magnetic material, experimental data, apertures, wave guide below cutoff, conductive gaskets, conductive windows, conductive coatings, cavity resonance, brooding of shields. **10 Hours**

UNIT - 8
ELECTROSTATIC DISCHARGE: State generation, human body model, static discharge, and ESD protection in equipment design, software and ESD protection, ESD versus EMC. **6 Hours**

TEXT BOOK:

1. **Noise reduction techniques in electronic systems**, Henry W. Ott, John Wiley, 2nd edition, 1988
6. **Engineering Electromagnetic Compatibility: Principles, Measurements & Technologies,** V. Prasad Kodali, S. Chand & Co. Ltd. Delhi, 2000.

REFERENCE BOOKS:
1. Electromagnetics Explained – A Hand Book For Wir eless/Rf,Emc And High Speed Electronoics.

10EEL77 Relay and High Voltage Laboratory

Subject Code	:	10EEL77	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

(Total 12 experiments are to be conducted by choosing at least 03 experiments from part A, 02 each from part-B and C and 05 from part-D)

PART - A

1. Over current relay **:**
   (a) IDMT non-directional characteristics
   (b) Directional features
   (c) IDMT directional
2. IDMT characteristics of over voltage or under voltage relay.(solid state or electromechanical type
3. (a) To determine 50% probability flashover voltage for air insulation subjected to impulse voltage.
   (b) Generation of standard lightning impulse voltage and to determine efficiency and energy of impulse generator.
   Operating characteristics of over voltage or under voltage relay. (Solid state or electromechanical type).
4. Operation of negative sequence relay.
5. Bias characteristics of differential relay.
6. Current-time characteristics of fuse.

PART - B

1. Operating characteristics of microprocessor based (numeric) over –current relay.
2. Operating characteristics of microprocessor based (numeric) distance relay.
3 Operating characteristics of microprocessor based (numeric) over/under voltage relay.

PART - C

1. Generator protection –Merz-Price- protection s cheme.
2. Feeder protection scheme-fault studies.
3. Motor protection scheme-fault studies.

PART - D

1. Spark over characteristics of air insulation subjected to high voltage AC with spark over voltage corrected to STP.
2 Spark over characteristics of air insulation subjected to high voltage AC, with spark over voltage corrected to STP for uniform and non-uniform field configuration.
3 Spark over characteristics of air insulation subjected to high voltage DC
4 Measurement of HVAC and HVDC using standard spheres.
5 Breakdown strength of transformer oil using oil-testing unit.
6. Field mapping using electrolytic tank for any one-model cable/capacitor/transmission line/ Sphere gap models.

10EEL78 Power System Simulation Laboratory

Subject Code	:	**10EEL78**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

Power system simulation using MATLAB/ C or C ++ /Sci lab /octave

2. a) Y Bus formation for power systems with and without mutual coupling, by singular transformation and inspection method.
   b) Determination of bus currents, bus power and line flow for a specified system voltage (Bus) Profile

2. Formation of Z-bus(without mutual coupling) using Z-bus building Algorithm .
3. ABCD parameters: Formation for symmetric π/T configuration. Verification of AD-BC=1 Determination of efficiency and regulation
4. Determination of power angle diagrams, reluctance power, excitation, emf and regulation for salient and non-salient pole synchronous machines,.
5 To obtain swing curve and to determine critical clearing time and regulation for a single machine connected to infinity bus through a pair of identical transmission lines under 3-phase fault on one of the lines for variation of inertia constant/line parameters /fault location/clearing time/pre-fault electrical output.
6. Formation of Jacobian for a system not exceeding 4 buses (no PV buses) in polar coordinates
7. Write a program to perform load using Gauss- Seidel method (only p q bus)
8. To determine fault currents and voltages in a single transmission line system with star-delta transformers at a specified location for LG, LLG.
9. Load flow analysis using Gauss Siedel method, NR method, Fast decoupled method for both pq and pv buses.
10. Optimal Generation Scheduling for Thermal power plants.

Note: Questions 1-7: Simulation Experiments using MATLAB/C or C++/Scilab/Octave
Questions 8-10: Use suitable standard software package.

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10EE81 ELECTRICAL DESIGN, ESTIMATING AND COSTING

Subject Code	:	**10EE81**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT: 1
GENERAL PRINCIPLES OF ESTIMATION: Introduction to estimation & costing, Electrical Schedule, Catalogues, Market Survey and source selection, Recording of estimates, Determination of required quantity of material, Labor conditions, Determination of cost material and labour, Contingencies, Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Tender form, General idea about IE rule, Indian Electricity Act and major applicable I.E rules. **6Hours**

UNIT: 2
RESIDENTIAL BUILDING ELECTRIFICATION: General rules guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits, Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram, Selection of type of wiring and rating of wires and cables, Load calculations and selection of size of conductor, Selection of rating of main switch, distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation. **7Hours**

UNIT:3
ELECTRIFICATION OF COMMERCIAL INSTALLATION: Concept of commercial installation, Differentiate between electrification of residential and commercial installation, Fundamental considerations for planning of an electrical installation system for commercial building, Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables,busbar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation, Selection of type wire, wiring system and layout, Sequence to be followed to prepare estimate, Preparation of detailed estimate and costing of commercial installation. **7Hours**

UNIT: 4
SERVICE CONNECTION, INSPECTION AND TESTING OF INSTALLATION: Concept of service connection, Types of service connection and their features, Method of installation of service connection, Estimates of under ground and overhead service connections, Inspection of internal wiring installations, Inspection of new installations, Testing of installations, Testing of wiring installations, Reason for excess recording of energy consumption by energy meter. **6Hours**

PART- B

UNIT: 5
ELECTRICAL INSTALLATION FOR POWER CIRCUITS: Introduction, Important considerations regarding motor installation wiring, Determination of input power, Determination of input current to motors, Determination of rating of cables, determination of rating of fuse, Determination of size of Condit, distribution Board main switch and starter**. 6Hours**

UNIT:6 and 7
DESIGN AND ESTIMATION OF OVERHEAD TRANSMISSION & DISTRIBUTION LINES:
Introduction, Typical AC electrical power system, Main components of overhead lines, Line supports, Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers, Muffs, Points to be considered at the time of erection of overhead lines, Erection of supports, Setting of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor , Dead end clamps, Positioning of conductors and attachment to insulators, Jumpers, Tee-offs, Earthing of transmission lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between conductors, Testing and commissioning of overhead distribution lines, Some important specifications. **12Hours**
UNIT: 8
DESIGN AND ESTIMATION OF SUBSTATIONS: Introduction, Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram, Key diagram of typical substations, Equipment for substation and switchgear installations, Substation auxiliaries supply, Substation Earthing **6Hours**

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TEXT BOOK:
1. **Electrical Installation Estimating & Costing,**J.B.Gupta,VIII Edition S.K. Katria & Sons New Delhi

REFERENCE BOOKS :
1. **Electrical Design Estimating and Costing,** K.B.Raina S.K.Bhattacharya, New Age International
4. **Electrical Wiring Estimating and Costing,** Uppal, Khanna Publishers Delhi
5. **I.E.Rules and Act Manuals**

10EE82 POWER SYSTEM OPERATION AND CONTROL

Subject Code	:	**10EE82**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
CONTROL CENTER OPERATION OF POWER SYSTEMS:
Power system control and operating states, control center, digital computer configuration, automatic generation control, area control error, operation without central computers, expression for tie-line flow and frequency deviation, parallel operation of generators, area lumped dynamic model. **8 Hours**
UNIT - 2 & 3
AUTOMATIC VOLTAGE REGULATOR: Basic generator control loops, Cross-coupling between control loops, Exciter types, Exciter modeling, Generator modeling, Static performance of AVR loop.
AUTOMATIC LOAD FREQUENCY CONTROL:
Automatic Load frequency control of single area systems, Speed governing system, Hydraulic valve actuator, Turbine generator response, Static performance of speed governor, Closing of ALFC loop, Concept of control area, Static response of primary ALFC loop, Integral control, ALFC of multi-control area systems (POOL operation),The Two-Area system, Modeling the Tie-Line, Block Diagram representation of Two-Area system, Static response of Two-Area system and Tie-Line Bias control.

12 Hours

UNIT - 4

CONTROL OF VOLTAGE AND REACTIVE POWER: Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of voltage control, sub synchronous resonance, voltage stability, voltage collapse.

6 Hours

PART - B

UNIT - 5

OPTIMAL SYSTEM OPERATION AND UNIT COMMITMENT: Introduction , Optimal operation of generators on a bus bar, Statement of the Unit Commitment problem, need and importance of unit commitment, Constraint in Unit Commitment, Unit Commitment solution methods-Priority lists method, Forward Dynamic Programming method(excluding problem), Spinning reserve. **6 Hours**

UNIT - 6

POWER SYSTEM SECURITY: Introduction, factors affecting power system security, Security analysis, Contingency Selection, Techniques for contingency evaluation-D.C. load flow and fast decoupled load flow. **6 Hours**

UNIT 7

SYSTEM MONITORING AND CONTROL: Introduction , Energy management system, the basis of power system state estimation(PSSE), mathematical description of PSSE process, minimization technique for PSSE, Least Square estimation, Error and detection in PSSE, System security and emergency control.

6 Hours

UNIT- 8

POWER SYSTEM RELIABILITY: Introduction, Modes of failures of a system, Generating system and its performance, derivation of reliability index, reliability measure for N- unit system, cumulative probability outages- Recursive Relation, Loss of load probability, Frequency and duration of a state.

8 Hours

Text Books:

6. **Modern Power System Analysis-** I J Nagarath and D P Kothari, TMH, 3rd Edition, 2003
7. **Electrical Energy Systems Theory**, O.J Elgerd, TMH,2008.
8. **Power generation, operation and control-** Allen J Wood & Woollenberg. John Wiley and Sons, Second Edition, 2009.
9. **Electric Power Systems-** B.M.Weedy and B.J. Cory, Wiley student edition, 1999
10. **Computer Aided Power System Operation and Analysis-** R.N. Dhar, Tata McGraw-Hill, 1987.

REFERENCE:

3. **Computer Aided Power System Analysis-** G.L.Kusic, PHI,2010.
4. **Power System Analysis, Operation and Control,** Abhijit Chakrabarti and Sunita Halder, PHI, Second Edition, 2009
3. **Power system stability and control,** Prabha Kundur, TMH, 9th reprint, 2007.

ELECTIVE – IV (GROUP - D)

10EE831 REACTIVE POWER MANAGEMENT

Subject Code	:	**10EE831**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT – 1

Introduction, Importance of reactive power control in EPS, Reactive power devices. **4 Hours**

UNIT – 2

Theory of Load Compensation: Introduction- Requirement for compensation, Objectives in load compensation, Specifications of a load compensator, Power factor correction and voltage regulations in single phase system, Phase balancing and p. f. correction of unsymmetrical loads, Compensation in term of symmetrical components. **8 Hours**

UNIT – 3

Reactive Power Control: Fundamental requirement in AC Power transmission, Fundamental transmission line equation, Surge impedance and natural loading, Voltage and current profiles of uncompensated radial and symmetrical line on open circuit, Uncompensated line under load, Effect of line length, Load power and p. f on voltage and reactive power. **8 Hours**

UNIT – 4

Passive and active compensators, Uniformly distributed fixed compensation, Passive shunt compensation, Control of open circuit voltage by shunt reactance, Reactance of shunt reactors, multiple shunt reactors along the line. **6 Hours**

PART – B

UNIT - 5

Series compensation: Objectives and practical limitations, Symmetrical line with mid-point series capacitor and shunt reactor, Power transfer characteristics and maximum transmissible power for a general case, Fundamental concepts of compensation by sectioning. **6 Hours**

UNIT - 6

Principles of Static Compensation: Principle of operation of thyristor controlled reactor, Thyristors switched capacitor. Series Capacitors: Introduction, protective gear, reinsertion schemes, Varistor protective gear. **6 Hours**

UNIT – 7

Synchronous Condenser: Introduction, Power system Voltage control, Emergency reactive power supply, Starting methods, starting motor, reduced voltage starting, static starting. **6 Hours**

UNIT – 8

Harmonics effects, resonance, shunt capacitors and filters, telephone interferences, Reactive Power Co-ordination, Reactive power management, transmission benefits, reactive power dispatch & equipment impact. **8Hours**

TEXT BOOKS:

3. **Reactive power control in electric power systems**, T. J. E. Miller, John Wiley & Sons NY 2009
4. **Reactive Power Management**, D. Tagare, TMH, 1^{st} Edition,2004.

REFERENCE BOOKS:

2. **Power System Stability and Control**,P. Kundur, TMH, 9^{th} reprint, 2007.
2. **Power System Voltage Stability**, Carson. W. Taylor, McGraw-Hill, Inc.

10EE832 FLEXIBLE A.C. TRANSMISSION SYSTEMS (FACTS)

Subject Code	:	**10EE832**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1 & 2
Facts, Concepts and general system configuration: Transmission, interconnection, flow of power in AC system, power flow and dynamic stability consideration of a transmission interconnection, relative importance of controllable parameters, basic types of FACTs controllers, shunt, series, combined shunt and series connected controllers. **10 Hours**

UNIT -3
POWER SEMICONDUCTOR DEVICES: types of high power devices, principle of high power device characteristics and requirements, power device material, diode, MOSFET, MOS turn OFF thyristor, emitter turn OFF thyristor, integrated gate commuted thyristor (GCT & IGCT). **10 Hours**

UNIT -4
VOLTAGE SOURCED CONVERTERS: Basic concepts, single-phase full wave bridge converter operation, square wave voltage harmonics for a single-phase bridge 3-phase full wave converter. **6 Hours**

PART – B

UNIT -5
SELF AND LINE COMMUTATED CURRENT SOURCE CONVERTER: Basic concepts, 3 phase full wave rectifier, thyristor based converter, current sourced converter with turnoff devices, current sourced versus voltage source converter. **6 Hours**

UNIT -6
STATIC SHUNT COMPENSATORS SVC AND STATCOM: Objective of shunt compensation, methods of controllable Var generation, static Var compensator, SVC and STA TCOM, comparison between, SVC and STA TCOM. **10 Hours**

UNIT -7& 8
STATIC SERIES COMPENSATORS: GCSC, TSSC, TCSC and SSSC, objectives of series compensation, variables impedance type of series compensation, switching converter type series compensation, external control for series reactive compensators. **10 Hours**

TEXT BOOKS:

2. **Understanding Facts - Concepts and technology of flexible AC Transmission system,** N.G.Hungorian & Laszlo gyugyi IEEE Press, standard publisher, 2001.

REFERENCE BOOKS:

1. **EHV - AC, HYDC Transmission & Distribution Engineering,** S.Rao,Khanna publishers, 3^{rd} edition 2003.
3. **FACTS - Controllers in Power Transmission distribution** - K.R. Padiyar - New age publishers - 2007.

10EE833 ADVANCED INSTRUMENTATION SYSTEM

Subject Code	:	**10EE833**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1
Instrumentation: Frequency meter, measurement of time and frequency (mains), tachometer, phase meter, capacitance meter. Automation in digital Instrumentation. **6 Hours**
UNIT – 2
Analyzer: Wave analyzers and Harmonic distortion, Basic wave analyzer, Frequency selective wave analyzer, Harmonic distortion analyzer and Spectrum analyzer**. 8 Hours**
UNIT – 3
Measuring Instruments: Output power meters, Field strength meter Vector impedance meter, Q meter applications-Z, Z_0 and Q. Basic LCR bridge, RX meters**. 6 Hours**
UNIT – 4
Recorders: Strip chart recorder- applications of Strip chart recorder, Magnetic recorders, Frequency modulation (FM) recording, Digital data recording, Digital memory waveform recorder. **6 Hours**

Part – B

UNIT – 5
Transducers: Synchro's, Capacitance Transducers, Load cells, Piezo electrical Transducers, IC type temperature sensors, Pyrometers, Ultrasonic temperature Transducer, Reluctance pulse pick-ups, Flow measurement-mechanical Transducers; Magnetic flow meters, turbine flow meters. β-gauge.
8 Hours
UNIT – 6
Data acquisition and conversion: Generalized data acquisition system (DAS), Signal conditioning of inputs, single channel DAS, multi channel DAS, data loggers, compact data logger. **6 Hours**
UNIT – 7
Measurement of power: Measurement of large amount of RF power (calorimetric method),measurement of power on a transmission line, standing wave ratio measurements, measurement of standing wave ratio using directional couplers. **6 Hours**
UNIT – 8
Data transmission: Serial, asynchronous interfacing, data line monitors, RS-232 standard, universal serial bus,IEEE-1394.Long distance data transmission(modems).IEEE 488 bus. Electrical interface. **6 Hours**

TEXT BOOKS:

1.**Electronic Instrumentation,**H S Kalsi,TMH,3rd Edition,2010**.**
2.**Modern Electronic Instrumentation and Measuring Techniques,** Cooper D and A D Helfrick,PHI,2009
3. **Stuent Reference Manual for Electronic Instrumentation Laboratories,** Stanly Wolf,Richard F H,Smith,PHI,2nd Edition,2010.

10EE834 AI APPLICATIONS TO POWER SYSTEMS

Subject Code	:	10EE834	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

Sparsity oriented Programming: Introduction, physical structure and sparsity, pivoting, conservation of sparsity by optimal ordering of buses, schemes for ordering, UD table storage scheme.

6 Hours

UNIT - 2

Artificial Intelligence: What is AI? Definitions, history and evolution, essential abilities of intelligence, AI applications; Problem solving: problem characteristics, problem search strategies, forward and backward reasoning, AND-OR graphs, game trees, search methods- informed and uninformed search, breadth first search and depth first search methods. **8 Hours**

UNIT – 3 and 4

Knowledge representation: logical formalisms: propositional and predicate logic: syntax and semantics, wffs, clause form expressions, resolution- use of RRTs for proofs and answers, examples from electric power systems, Non-monotonic logic: TMS, modal, temporal and fuzzy logic. **12 Hours**

Part – B

UNIT – 5

Structured representation of knowledge: ISA/ISPART trees, semantic nets, frames and scripts, examples from electric systems. **07 Hours**

UNIT – 6

Expert systems: Basic components, forward and backward chaining, ES features, ES development, ES categories, ES tools and examples from electric drive systems. **07 Hours**

UNIT –7 and 8

AI languages: LisP and ProLog - Introduction, sample segments, LisP primitives, list manipulation functions, function predicates, variables, iteration and recursion, property lists, sample programs for examples from electric power systems. **12 Hours**

REFERENCE BOOKS:

7. **Introduction to Artificial Intelligence and Expert Systems,** D.W.Patterson,PHI, 2009.
8. **Computer Methods for Circuit Analysis and Design,** J.Vlach and Singhal, CBS Publishers, 1986.

9. **Artificial Intelligence,** Rich, Elaine, Kevin Knight, TMH, 3rd Edition, 2008.
10. **Introduction to AI,** Charniak E. and Mcdermott D ,Pearson Education.
11. **Problem Solving Methods in AI,** Nils J.Nilson ,McGraw-Hill, 1971.
12. **Principles of AI,** Nils J.Nilson, Berlin Springer-Verlag, 1980

10EE835 DATA BASE MANAGEMENT SYSTEMS (DBMS)

Subject Code	:	**10EE835**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT- 1
INTRODUCTION TO DATA BASE SYSTEMS : Managing data, a historical perspective, File systems versus DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Queries in DBMS, Transaction management, Structure of DBMS, People who work with databases. **4 Hours**
UNIT -2
ENITTY – RELATIONSHIP MODEL : Using high- Level Conceptual Data Models for Database Design, An example of Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY database, ER Diagrams, Naming Conventions and Design Issues. **6 Hours**
Electronic Instrumentation
RELATIONAL MODEL AND RELATIONAL ALGEBRA: Relational model concepts, relational model constraints and relational database schemes, update operations and dealing with Constraint Violations, Unary relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, examples of Queries in Relational algebra, relational database design using ER-to-Relational mapping. **6 Hours**

UNIT- 4
SQL –THE RELATIONAL DATABASE STANDARD : SQL Data definition and data types, specifying basic constraints in SQL, Schemes, Change statements in SQL, basic Queries in SQL, more complex SQL queries, Insert, Delete and update statements in SQL, additional features SQL, specifying general constraints as assertion, views (virtual tables) in SQL, database Programming, issues and Techniques, Embedded SQL, Dynamic SQL, more examples; PL/SQL **10 Hours**

PART- B

UNIT- 5
DATABASE DESIGN: Informal Design Guidelines for Relation Schemes, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties of Relational Decompositions. **6 Hours**

UNIT- 6
b: Introduction Security, Access control, Discretionary Access, Mandatory Access Control
6 Hours
UNIT – 7 & 8
TRANSACTION MANAGEMENT:The ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Lock-based Concurrency control, performance of locking, Transaction support In SQL, Introduction to crash recovery; 2PL, for serializability and recoverability, Introduction to lock management, Lock Conversions, Dealing with Deadlocks, Specialized locking Techniques, Concurrency control without locking, Introduction to ARIES, The log, Other Recovery related Data Structures, The write-ahead log Protocol, Check pointing, Recovering from a System Crash, Media Recovery, Other Algorithms and Interaction with Concurrency control. **14 Hours**

TEXT BOOKS:

1. **Database Management Systems,** Raghu Ramakrishnan and Johannes Gehrke, McGraw Hill, 3rd Edition, 2003.

.

2. **Fundamentals of Database Systems,** Elmasri and Navathe, Pearson Education, 5th Edition, 2003.

REFERENCE:

1. **Database System concepts,** Silberschatz Kortts Sudharshan , McGraw Hill, 5th edition,2006.
2. **Database System concepts,** Peter Rob, Carlos Coronel, Cengage Learning,First Edition,2008

10EE836 RENEWABLE ENERGY SOURCES

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

ENERGY SOURCES: Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. **4 Hours**

UNIT - 2

SOLAR ENERGY BASICS: Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (numerical problems), Estimation of Solar Radiation of Horizontal and Tilted Surfaces (numerical problems); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **6 Hours**

UNIT - 3

SOLAR THERMAL SYSTEMS: Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Bo x type, concentrating dish type, Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. **6 Hours**

UNIT - 4

SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation – Solar Po nd and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fund amentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-a lone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems. **7 Hours**

ENERGY STORAGE: Introduction, Necessity of Energy Storage, and Methods of Energy Storage (classification and brief description using block diagram representation only). **3 Hours**

PART - B

UNIT - 5

WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection consideration, Advantages and Disadvantages of WECS. **8 Hours**

UNIT - 6

BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KV IC and Janata model; Biomass program in India. **6 Hours**

UNIT - 7
ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Estimation of Energy – Single basin and Double basin type TPP (no derivations. Simple numerical problems), Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC. **6 Hours**

UNIT - 8
EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, and Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations). **6 Hours**

TEXT BOOKS:

3. **Non-Conventional Sources of Energy,**Rai, G. D, Khanna Publishers, 4th Edition, 2007
4. **Non-Conventional Energy Resources,** Khan, B. H., TMH, 2nd Edition.

REFERENCE BOOK:

1. **Fundamentals of Renewable Energy Systems,** Mukherjee, D and Chakrabarti, S., New Age International Publishers, 2005.

ELECTIVE –V (GROUP - E)

10EE841 POWER SYSTEMS DYNAMICS AND STABILITY

Subject Code	:	**10EE841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Basic concepts, Review of classical methods. **2 Hours**
UNIT - 2 & 3
SYSTEM MODELING AND DYNAMICS OF SYNCHRONOUS GENERATOR: Modeling of synchronous machine, Swing equation, Park's transformation – Park's voltage equation, Park's mechanica l equation (torque). Applications – (a) Voltage build up in synchronous machine, and (b) Symmetrical short circuit of generator. Solution for transient analysis, Operational impedance, Relationship between Tdo/ and Tdo//, Algebraic constraints. **14 Hours**
UNIT - 4
EXCITATION AND PRIME MOVER CONTROLLERS: Introduction, Types of excitation, AVR with and without ESS, TGR, Amplifier PSS, Static exciters. **8 Hours**

PART - B

UNIT - 5
MODELING OF PRIME MOVERS: Introduction, Three major components, Block diagram, Hydraulic turbine, Steam turbine. **8 Hours**
UNIT - 6
LOAD MODELING: Introduction, Two approaches – Polynomial model an d Exponential model. Small Signal Angle Stability: Small signal angle stability with SMIB system, detailed model of SMIB. **10 Hours**

UNIT - 7 & 8

TRANSIENT STABILITY ANALYSIS: Simulation for Transient stability Evaluation, Transient stability controllers. **10 Hours**

TEXT BOOKS:

1. **Power System Dynamics, Stability and Control**,Padiyar K.R., Interline Publications.
2. **Power System Stability and Control,** Prabha Kundur. TMH, 9th Reprint.

REFERENCE BOOKS:

3. **Dynamics and Control of Large Electric Power Systems,** Marija Ilic; John Zaborszky, , IEEE Press and John Wiley & Sons, Inc, 2007
4. **Power System Control and Stability Revised Printing,** Paul M. Anderson and A. A. Fouad, IEEE Press and John Wiley & Sons, Inc, 2002.
3. **Selected topics from IEEE Transaction and Conference Proceedings**

10EE842 ENERGY AUDITING & DEMAND SIDE MANAGEMENT

Subject Code	:	**10EE842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Energy situation – world and India, energy consum ption, conservation, Codes, standards and Legislation. **6 Hours**

UNIT - 2

ENERGY ECONOMIC ANALYSIS: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems. **7 Hours**

UNIT - 3

ENERGY AUDITING: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results. **8 Hours**

UNIT - 4

ELECTRICAL SYSTEM OPTIMIZATION: The power triangle, motor horsepower, power flow concept. **5 Hours**

PART - B

UNIT - 5 & 6

ELECTRICAL EQUIPMENT AND POWER FACTOR –correction & location of capacitors, energy efficient motors, lighting basics, electrical tariff, Concept of ABT. **10 Hours**

UNIT - 7 & 8

DEMAND SIDE MANAGEMENT: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-util ity power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs. **16 Hours**

TEXT BOOKS:

1. **Industrial Energy Management Systems,** Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York.

2. **Fundamentals of Energy Engineering -** Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey.

3. **Electrical Power distribution**, A S. Pabla, TMH, 5th edition, 2004

REFERENCE BOOKS:

1. **Recent Advances in Control and Management of Energy Systems**, D.P.Sen, K.R.Padiyar, Indrane Sen, M.A.Pai, Interline Publisher, Bangalore, 1993.
2. **Energy Demand – Analysis, Management and Conservati on,** Ashok V. Desai, Wiley Eastern, 2005.
3. **Demand Side Managementm,** Jyothi Prakash, TMH Publishers.
4. **Hand book on energy auditing** - TERI (Tata Energy Research Institute)

10EE843 DATA COMMUNICATIONS AND NETWORKING

Subject Code	:	**10EE843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Data Communications; Networks; the Internet; Protocols and Standards; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite**. 6 Hours**

UNIT - 2

DATA, SIGNALS, AND DIGITAL TRANSMISSION : Analog and digital signals; Transmission impairment; Data rate limits; Performance; Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes. **8 Hours**

UNIT - 3

ANALOG TRANSMISSION AND MULTIPLEXING: Digital - to - Analog conversion; Analog - to - Analog conversion; Multiplexing; Spread spectrum. **6 Hours**

UNIT - 4

TRANSMISSION MEDIA, ERROR DETECTION AND CORRECTION: Twisted pair cable, Coaxial cable, Fibre-Optic cable, Radio waves, Microwaves, Infrared. Introduction to error detection / correction; Block coding; Linear block codes; Cyclic codes, Checksum. **6 Hours**

PART - B

UNIT - 5

DATA LINK CONTROL: Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases. **7 Hours**

UNIT - 6

MULTIPLE ACCESS, ETHERNET: Random Access; Controlled Access; Channelization. Ethernet: IEEE standards; Standard Ethernet and changes in the standard; Fast Ethernet; Gigabit Ethernet. **7 Hours**

UNIT - 7

WIRELESS LANS AND CONNECTION OF LANS: IEE 802.11; Bluetooth. Connecting devices; Backbone Networks; Virtual LANs. **6 Hours**

UNIT - 8

OTHER TECHNOLOGIES: Cellular telephony; SONET / SDH: Architecture, Layers, Frames; STS multiplexing. ATM: Design goals, problems, architecture, switching, layers. **6 Hours**

TEXT BOOK:

1. **Data Communications and Networking** – Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition, , 2006.

REFERENCE BOOKS:

1. **Communication Networks: Fundamental Concepts and Key Architectures -** Alberto Leon, Garcia and Indra Widjaja, , Tata McGraw- Hill ,2nd Edition, 2004.
2. **Data and Computer Communication**, William Stallings, Pearson Education, 8th Edition, 2007.

3. **Computer Networks: A Systems Approach -** Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
4. **Introduction to Data Communications and Networking** – Wayne Tomasi, Pearson Education, 2005.
5. **Computer and Communication Networks** – Nader F. Mir, Pearson Education, 2007.

10EE843 ELECTRICAL DISTRIBUTION SYSTEMS

Subject Code	:	**10EE844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
POWER SYSTEM PLANNING AND AUTOMATION: Introduction, Factors affecting system planning, present planning techniques, planning models, future trends in planning, systems approach, distribution automation. **8 Hours**

UNIT - 2
LOAD CHARACTERISTIC: Basic definition, relation between load and load factor, load growth.
6 Hours

UNIT - 3 & 4
3. SYSTEM PLANNING: Planning process, planning criteria, system developers, dispersed generation, distribution systems, economics and finance, mapping. **12 Hours**

PART - B

UNIT - 5 & 6
DESIGN AND OPERATION: Engineering design, operation criteria, substation and feeder, voltage control, harmonics, load variations, system losses, energy management. **10 Hours**

UNIT - 7
DISTRIBUTION AUTOMATION: Definitions, communication, sensors, SCADA. **8 Hours**

UNIT - 8
OPTIMIZATION: Introduction, costing of schemes, typical network configurations, planning terms, network cost modeling, synthesis of optimum line network. **8 Hours**

TEXT BOOKS:

4. **Electric power distribution system engineering,** Turan Gonen, CRC Press,2nd Edition.
5. **Electric power distribution**-A S. Pabla, TMH, 5th edition, 2004
6. **Hand Book of Electrical Power Distribution,** Gorti Ramamurthy,University Press,2nd Edition,2009.

10EE845 INSULATION ENGINEERING

Subject Code	:	**10EE845**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
ELECTROSTATIC FIELD, THEIR CONTROL AND ESTIMATIONS: Electric Field Intensity, Electric Strength, Classification of Electric Fields, Degree of Uniformity of Electric Fields, control of Electric field Intensity (stress control), Estimation of Electric Field Intensity, Basic Equations for potential and Field Intensity in Electrostatic Fields, Analysis of Electric Field Intensity in Homogeneous Isotropic single dielectric only direct solution of Laplace equation, Analysis of Electric field Intensity in Isotropic Multi dielectric system. **7 Hours**

UNIT - 2
INSULATION SYSTEM IN POWER SYSTEM APPARATUS: Insulation system in capacitors, bushings, and transformers modes of failure of insulation systems. Insulations used in rotating machines.
6 Hour

UNIT - 3
DIELECTRIC PHENOMENA: Dielectric phenomena in in solid insulation. Macroscopic approach for describing the Dielectric phenomena microscopic treatment for Dielectric phenomena. **7 Hours**

UNIT - 4
PROPERTIES OF INSULATION MATERIALS: Introduction to properties of solid insulating materials (both of natural origin and synthetic types) Properties of liquid insulating materials. **6 Hours**

PART - B

UNIT - 5
GASEOUS INSULATION: Requirement of gaseous insulation. Breakdown process: types of collision, Elastic and inelastic, collision cross-section, Mobility of ions, Diffusion of charges, Emission of radiation and excitation, various secondary process and recombination, Mobility controlled and diffusion controlled breakdown. Gas insulated substations. **9 Hours**

UNIT – 6 ,7 and **8**
AGEING PHENOMENA: Failure of electric insulation due to ageing. Ageing mechanisms- Thermal ageing, Electrical ageing, combined thermal and electrical ageing.
Analysis of insulation failure data, Power law model, Graphical estimation of power law constants, ageing date, plotting position and cumulative probability. **17 Hours**

TEXT BOOKS:
1. **Fundamentals of gaseous ionization and plasma electronics,** Nasser E. John Wiley Interscience, New York, 1971.
2. **Methods of statistical analysis and life data,** Hann N.R. Schafer R.E. and Singapore wall N.D. John Wiley and sons, New York, 2002.
3. **Theory of electric polarization**, Bother C.J.F. Elsevier Publications.
4. **High Voltage Insulation Engineering,** Ravindra Arora, Wolfgang Mosch, New age International Publishers Ltd.

REFERENCE BOOKS:
1. **Electrical insulation,** Bradwell A. Peter Peregrinus Ltd, London, 1993.
2. **Electrical breakdown of gases,** J.M. Meek and J.D. Craggs, "Oxford university pres s, 11953
3. **High voltage Engineering fundamentals,** E. Kufell and W.S. Zaengl, and J. Kufell, 2nd edition, Elsevier 2005
4. **High voltage Engineering,** M.S. Naidu and V Kamaraju, TMH, 4th edition, 2008.
5. **Gas Insulated Substations**, M.S. Naidu,I K International Publishing House,2008 Edition.

10EE846 INTELLECTUAL PROPERTY RIGHTS

Subject Code	:	**10EE846**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, Protection of Knowledge in general, International Treaties-Paries Convention, TRIPS-treaty.
4 Hour

UNIT – 2
Intellectual Property Rights with exception of Patents – Copyright and neighboring rights, Auteurswet 1912, Neighboring rights, Database law, unified Benelux law relating to Trademarks, Trade Name law.
8 Hour

UNIT – 3 and 4
Utility model,Unified Benelux law relating to Industrial Designs, Protection of Plant Varities, Topographies and Semiconductor Products, Countering inadmissible competition. **12 Hour**

PART – B

UNIT – 5
Legal Regulations relating to Patents – Strasbourg Treaty, European Patent convention, Patent Cooperation Treaty, Patent Law Treaty. **6 Hour**

UNIT – 6
Obtaining a European Patent-official procedure in Europe, Rights conferred by a European Patent Application or a European Patent, International Patent Application-Official International procedure, Rights conferred by an International Patent Application. **10 Hour**

UNIT – 7
Patent Systems in Germany and United Kingdom, Patent System in USA, Patent System in Japan, Patent System in India. **6Hour**

UNIT – 8
Selected Topics – Novelty and Incentive Step, Indus trial Application, Supplementary Protection Certificates**,** What does a Patent Attorney do with patents? **6 Hour**

TEXT BOOKS:
1. **Intellectual Proper Law,** Narayan P, Eastern Law House(P)Ltd.
2. **Law of Patent,** Elizabeth Berti, Eastern Book Company,India,First Edition, 2005.
3. **Managing Intellectual Property-The Strategic Imperative**, Vonod V Sople,PHI,2008

REFERENCE BOOKS:
1. **Intellectual Property,** David Brainbridge, Pearson Education,5th Edition, Indian Reprint,2003**.**

10EE847 ELECTRICAL POWER QUALITY

Subject Code	:	10EE847	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, Power quality-voltage quality, power quality evaluation procedures term and definitions: general classes of power quality problems, transients, long duration voltage variation, short duration voltage variations, voltage imbalance, waveform distortion, power quality terms. **8 Hours**

UNIT - 2
VOLTAGE SAGS AND INTERRUPTIONS: Sources of sags and interruptions, estimating voltage sag performance, fundamental principles of protection, motor starting sags. **6 Hours**

UNIT - 3 & 4
TRANSIENT OVER VOLTAGES: Sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, Fundamentals of harmonics: Harmonic distortion, voltage versus transients, harmonic indexes, harmonic sources from commercial loads, harmonic sources from Industrial loads, effects of harmonic distortion, intraharmonics. **10 Hours**

PART - B

UNIT - 5
APPLIED HARMONICS: Harmonic distortion evaluations, principles for controlling harmonics, harmonic studies, devices for controlling harmonic distortion, harmonic filters, standards of harmonics
8 Hours

UNIT - 6
POWER QUALITY BENCHMARK: Introduction, benchmark process, power quality contract, power quality state estimation, including power quality in distribution planning. **6 Hours**

UNIT - 7
DISTRIBUTED GENERATION AND QUALITY: DG technologies, interface to utility system, power quality issues, interconnection standards. **6 Hours**

UNIT - 8
POWER QUALITY MONITORING: Monitoring considerations, power quality measurement equipments, assessment of power quality measurement data, application of intelligent systems, power quality monitoring standards. **8 Hours**

TEXT BOOK:
1. **Electric Power Quality,**Dugan, Roger C, Santoso, Surya, McGranaghan, Mark F/ Beaty, H. Wayne McGraw-Hill professional publication 2003.

REFERENCE BOOKS:
1. **Electric Power Quality,** G.T.Heydt, stars in a circle publications 1991.
2. **Modern Power Electronics,** M.H.Rashid TATA McGraw Hill 2002.
3. **Understanding power quality problems voltage sags and interruptions-** Math H. J. Bollen. IEEE Press, 2000
4. **Power quality in power systems and electrical machines,** Ewald F Fuchs ,Mohammad A.S., Masoum,Academic Press,Elsevier,2009.

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Mechanical Engineering

SCHEME OF TEACHING AND EXAMINATION

B.E. MECHANICAL ENGINEERING

III SEMESTER

Sl. No	**Sub-Code**	**Title**	**Teaching Dept.**	**Teaching hours /week**		**Examination**			
				Theory	**Pract. /Drg.**	**Dura-tion**	**I.A. Marks**	**Theory/ Pract.**	**Total Marks**
1	10MAT31	Engineering Mathematics - III	Mathematics	04	-	03	25	100	125
2	10ME32A/ 10ME32B	Material Sc. & Metallurgy / Mechanical Measurements & Metrology	Mechanical	04	--	03	25	100	125
3	10ME33	Basic Thermodynamics	Mechanical	04	--	03	25	100	125
4	10ME34	Mechanics of Materials	Mechanical	04	--	03	25	100	125
5	10ME35	Manufacturing Process I (Fundamentals of Foundry and Welding)	Mechanical	04	--	03	25	100	125
6	10ME36A/ 10ME36B	Computer Aided Machine Drawing / Fluid Mechanics	Mechanical	01 04	03 --	03	25	100	125
7	10MEL37A/ 10MEL37B	Metallography & Material Testing Lab / Mech. Measurements & Metrology Lab	Mechanical	--	03	03	25	50	75
8	10MEL38A/ 10MEL38B	Foundry & Forging lab / Machine Shop	Mechanical	--	03	03	25	50	75
TOTAL				**21/24**	**09**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION

B.E. MECHANICAL ENGINEERING

IV SEMESTER

Sl. No	**Sub-Code**	**Title**	**Teaching Dept.**	**Teaching hours /week**		**Examination**			
				Theory	**Pract./ Drg.**	**Dura-tion**	**I.A. Marks**	**Theory/ Pract.**	**Total Marks**
1	10MAT41	Engineering Mathematics - IV	Mathematics	04	-	03	25	100	125
2	10ME42A/ 10ME42B	Material Sc. & Metallurgy / Mechanical Measurements & Metrology	Mechanical	04	--	03	25	100	125
3	10ME43	Applied Thermodynamics	Mechanical	04	--	03	25	100	125
4	10ME44	Kinematics of Machines	Mechanical	04	--	03	25	100	125
5	10ME45	Manufacturing Process II	Mechanical	04	--	03	25	100	125
6	10ME46A/1 0ME46B	Computer Aided Machine Drawing / Fluid Mechanics	Mechanical	01 04	03 --	03	25	100	125
7	10MEL47A/ 10MEL47B	Metallography & Material Testing Lab / Mech. Measurements & Metrology Lab	Mechanical	--	03	03	25	50	75
8	10MEL48A/ 10MEL48B	Foundry & Forging lab / Machine Shop	Mechanical	--	03	03	25	50	75
TOTAL				**21/24**	**09**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION
B.E. MECHANICAL ENGINEERING

V SEMESTER

Sl. No	Sub-Code	Title	Teaching hours /week		Examination			
			Theory	Pract. / Drg.	Dura-tion	I.A. Marks	Theory/ Pract.	Total Marks
1	10AL51	Management and Entrepreneurship	04	--	03	25	100	125
2	10ME52	Design of Machine Elements I	04	--	03	25	100	125
3	10ME53	Energy Engineering	04	--	03	25	100	125
4	10ME54	Dynamics of Machines	04	--	03	25	100	125
5	10ME55	Manufacturing Process III	04	--	03	25	100	125
6	10ME56	Turbo Machines	04	--	03	25	100	125
7	10MEL57	Fluid Mechanics & Machines Lab	--	03	03	25	50	75
8	10MEL58	Energy Conversion Engg. Lab		03	03	25	50	75
TOTAL			**24**	**06**	**24**	**200**	**700**	**900**

SCHEME OF TEACHING AND EXAMINATION

B.E. MECHANICAL ENGINEERING

VI SEMESTER

Sl. No	Sub-Code	Title	Teaching hours /week		Examination			
			Theory	Pract. / Drg.	Dura-tion	I.A. Marks	Theory/ Pract.	Total Marks
1	10ME61	Computer Integrated Manufacturing	04	--	03	25	100	125
2	10ME62	Design of Machine Elements II	04	--	03	25	100	125
3	10ME63	Heat & Mass Transfer	04	--	03	25	100	125
4	10ME64	Finite Element Methods	04	--	03	25	100	125
5	10ME65	Mechatronics & Microprocessor	04	--	03	25	100	125
6	10ME66X	Elective ‘A’	04	--	03	25	100	125
7	10MEL67	Heat & Mass Transfer Lab	--	03	03	25	50	75
8	10MEL68	CAMA Lab	--	03	03	25	50	75
TOTAL			**24**	**06**	**24**	**200**	**700**	**900**

Elective – 1 (Group A)			
10ME661	Theory of Elasticity	10ME662	Mechanics of Composite Materials
10ME663	Refrigeration & Air Conditioning	10ME664	Design of Heat Exchangers
10ME665	Non-Traditional Machining	10ME666	Knowledge Management
10ME667	Project Management	10ME668	Statistical Quality Control

SCHEME OF TEACHING AND EXAMINATION

B.E. MECHANICAL ENGINEERING

VII SEMESTER

Sl. No	Sub-Code	Title	Teaching hours /week		Examination			
			Theory	Pract./ Drg.	Dura-tion	I.A. Marks	Theory/ Pract.	Total Marks
1	10ME71	Economics	04	--	03	25	100	125
2	10ME72	Mechanical Vibrations	04	--	03	25	100	125
3	10ME73	Hydraulics and Pneumatics	04	--	03	25	100	125
4	10ME74	Operations Research	04	--	03	25	100	125
5	10ME75X	Elective B	04	--	03	25	100	125
6	10ME76X	Elective C	04	--	03	25	100	125
7	10MEL77	Design Lab	--	03	03	25	50	75
8	10MEL78	CIM and Automation Lab	--	03	03	25	50	75
TOTAL			**24**	**06**	**24**	**200**	**700**	**900**

Elective – 2 (Group B)		**Elective – 3 (Group C)**	
10ME751	Mechanism Design	10ME761	Experimental Stress Analysis
10ME752	Theory of Plasticity	10ME762	Tool Design
10ME753	Engineering Design	10ME763	Cryogenics
10ME754	Non Conventional Energy Sources	10ME764	Smart Materials
10ME755	Gas Dynamics	10ME765	Agile Manufacturing
10ME756	Management Information System	10ME766	Robotics
10ME757	Automation in Manufacturing	10ME767	Finance Management
10ME758	Total Quality Management	10ME768	Micro & Smart System Technology
		10ME769	Product Life Cycle Management

SCHEME OF TEACHING AND EXAMINATION
B.E. MECHANICAL ENGINEERING

VIII SEMESTER

Sl. No	Sub-Code	Title	Teaching hours /week		Examination			
			Theory	Pract./ Drg.	Dura-tion	I.A. Marks	Theory/ Pract.	Total Marks
1	10ME81	Operations Management	04	--	03	25	100	125
2	10ME82	Control Engineering	04	--	03	25	100	125
3	10ME83X	Elective D	04	--	03	25	100	125
4	10ME84X	Elective E	04	--	03	25	100	125
5	10ME85L	Project Work	--	06	03	100	100	200
6	10ME86L	Seminar	--	03	--	50	--	50
TOTAL				**09**	**15**	**250**	**500**	**750**

Elective – 4 (Group D)		**Elective – 5 (Group E)**	
10ME831	Tribology	10ME841	Machine Tool Design
10ME832	Fracture Mechanics	10ME842	Industrial Engineering & Ergonomics
10ME833	Power Plant Engineering	10ME843	Bio Mass Energy Systems
10ME834	Nanotechnology	10ME844	Automotive Engineering
10ME835	Organisational Behaviour and Professional Communication	10ME845	Database Management System
10ME836	Computer Graphics	10ME846	Artificial Intelligence
10ME837	Rapid Prototyping	10ME847	Design of Experiments
10ME838	Foundry Technology	10ME848	Design for Manufacture & Assembly

III SEMESTER

ENGINEERING MATHEMATICS – III

Sub Code	**:**	**10MAT31**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A

UNIT-1

Fourier series

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*

Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis.

7 Hours

UNIT-2

Fourier Transforms

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms

6 Hours

UNIT-3

Application of PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.

6 Hours

UNIT-4

Curve Fitting and Optimisation

Curve fitting by the method of least squares- Fitting of curves of the form $y = ax+b$, $y = a x^2 + b x + c$, $y = a e^{bx}$, $y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

7 Hours

PART-B

UNIT-5

Numerical Methods - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

6 Hours

UNIT-6

Numerical Methods – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

7 Hours

UNIT-7

Numerical Methods – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations

7 Hours

UNIT-8

Difference Equations and Z-Transforms

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

6 Hours

Note: * In the case of illustrative examples, questions are not to be set.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

REFERENCE BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

MATERIAL SCIENCE AND METALLURGY

Subject Code	**: 10ME32A /42A**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

06 Hours

UNIT - 2

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

06 Hours

UNIT - 3

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.

07 Hours

UNIT - 4

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.

07 Hours

PART - B

UNIT - 5

Phase Diagram II: 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.

06 Hours

UNIT - 6

Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

07 Hours

UNIT - 7

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-Al-Cu,Al-Si,Al-Zn alloys.

06 Hours

UNIT - 8

Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

07 Hours

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4^{th} Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5^{th} Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4^{lh} Ed., 2003.

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Code	**: 10ME32B /42B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT-1

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringing phenomena, Indian Standards (M-81, M-12), Numerical problems on building of slip gauges.

06 Hours

UNIT-2

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge and gauge materials.

07 Hours

UNIT-3

Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparators-principles, Zeiss ultra optimeter, electric and electronic comparators-principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers.

07 Hours

UNIT-4:

Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer.

06 Hours

PART-B

UNIT-5:

Measurements and measurement systems: Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysterisis, repeatability, linearity, loading effect, system response-times delay. Errors in measurement, classification of errors. Transducers, transfer efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

07 Hours

UNIT-6

Intermediate modifying and terminating devices: Mechanical systems, inherent problems, electrical intermediate modifying devices, input circuitry, ballast circuit, electronic amplifiers and telemetry. Terminating devices, mechanical, cathode ray oscilloscope, oscillographs, X-Y plotters.

06 Hours

UNIT-7

Measurement of force, torque and pressure: Principle, analytical balance, platform balance, proving ring. Torque measurement, Prony brake, hydraulic dynamometer. Pressure measurements, principle, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge. **06 Hours**

UNIT-8

Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement.

07 Hours

TEXT BOOKS:

1. **Mechanical Measurements,** Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. **Engineering Metrology,** R.K. Jain, Khanna Publishers, 1994.

REFERENCE BOOKS:

1. **Engineering Metrology,** I.C. Gupta, Dhanpat Rai Publications, Delhi.
2. **Mechanical Measurements,** R.K. Jain Khanna Publishers, 1994
3. **Industrial Instrumentation,** Alsutko, Jerry. D. Faulk, Cengage Asia Pvt. Ltd. 2002.
4. **Measurement Systems Applications and Design,** Ernest O. Doebelin, 5^{th} Ed., McGraw Hill Book Co.
5. **Metrology & Measurement,** Anand K. Bewoor & Vinay A. Kulkarni, Tata McGraw Hill Pvt. Ltd., New-Delhi

BASIC THERMODYNAMICS

(Common to ME/IP/AU/IM/MA)

Subject Code	**: 10ME33**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Fndamental Concepts & Definitions: Thermodynamics definition and scope, Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and units, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic ;rocesses; Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium, Zeroth law of thermodynamics, Temperature; concepts, scales, fixed points and measurements.

06 Hours

UNIT - 2

Work and Heat: Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions for displacement work in various processes through p-v diagrams.

Shaft work; Electrical work. Other types of work. Heat; definition, units and sign convention.

06 Hours

UNIT - 3

First Law of Thermodynamics: Joules experiments, equivalence of heat and work. Statement of the First law of thermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat at constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as film and evacuation of vessels with and without heat transfer.

07 Hours

UNIT - 4

Second Law of Thermodynamics: Devices converting heat to work; (a) in a thermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir. Direct heat engine; schematic representation and efficiency. Devices converting work to heat in a theromodynamic cycle; reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II, Clausius statement of Second law of Thermodynamics,Equivalence of the two statements; Reversible and irrevesible processes; factors that make a process irreversible, reversible heat engines, Carnot cycle, Carnot principles.

07 Hours

PART-B

UNIT - 5

Entropy: Clasius inequality; Statement, proof, application to a reversible cycle. Entropy; definition, a property, change of entropy, principle of increase in entropy, entropy as a quantitative test for irreversibility, calculation of entropy using Tds relations, entropy as a coordinate. Available and unavailable energy.

06 Hours

UNIT - 6

Pure Substances: P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid, mixture of saturated liquid and vapour, saturated vapour and superheated vapour states of pure substance with water as example. Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S diagrams, representation of various processes on these diagrams. Steam tables and its use. Throttling calorimeter, separating and throttling calorimeter.

07 Hours

UNIT - 7

Thermodynamic relations: Maxwell relation, Clausius Clayperon's equation. Ideal gas; equation of state, internal energy and enthalpy as functions of temperature only, universal and particular gas constants, specific heats, perfect and semi-perfect gases. Evaluation of heat, work, change in internal energy. enthalpy and entropy in various quasi-static processes.

07 Hours

UNIT - 8

Ideal gas mixture : Ideal gas mixture; Dalton's laws of partial pressures, Amagat's law of additive volumes, evaluation of properties, Analysis of various processes. Real Gases: Introduction. Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties, Law of corresponding states, compressiblity factor; compressibility chart

06 Hours

Data Handbooks :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic Engineering Thermodynamics,** A.Venkatesh, Universities Press, 2008
2. **Basic and Applied Thermodynamics,** P.K.Nag, 2nd Ed., Tata McGraw Hill Pub. 2002

REFERENCE BOOKS:

1. **Thermodynamics**, An Engineering Approach, Yunus A.Cenegal and Michael A.Boles, Tata McGraw Hill publications, 2002
2. **Engineering Thermodynamics**, J.B.Jones and G.A.Hawkins, John Wiley and Sons..
3. **Fundamentals of Classical Thermodynamics**, G.J.Van Wylen and R.E.Sonntag, Wiley Eastern.
4. **An Introduction to Thermodynamcis**, Y.V.C.Rao, Wiley Eastern, 1993,
5. **B.K Venkanna, Swati B. Wadavadagi "Basic Thermodynamics,** PHI, New Delhi, 2010

MECHANICS OF MATERIALS

Subject Code	**: 10ME34**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT 1:

Simple Stress and Strain: Introduction, Stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain relation - behaviour in tension for Mild steel, cast iron and non ferrous metals. Extension / Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position.

07 Hours

UNIT 2:

Stress in Composite Section: Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars).

06 Hours

UNIT 3:

Compound Stresses: Introduction, Plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, Mohr's circle for plane stress.

07 Hours

UNIT 4:

Energy Methods: Work and strain energy, Strain energy in bar/beams, Castiglinios theorem, Energy methods.

Thick and Thin Cylinder Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders Lame’s equation (compound cylinders not included).

06 Hours

PART-B

UNIT 5:

Bending Moment and Shear Force in Beams: Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.

07 Hours

UNIT 6:

Bending and Shear Stresses in Beams: Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress, radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections. (composite / notched beams not included).

07 Hours

UNIT 7:

Deflection of Beams: Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple. Macaulay's method

06 Hours

UNIT 8:

Torsion of Circular Shafts and Elastic Stability of Columns:
Introduction. Pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts

Columns: Euler's theory for axially loaded elastic long columns. Derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula.

06 Hours

TEXT BOOKS:

1. **"Mechanics of Materials",** by R.C.Hibbeler, Prentice Hall. Pearson Edu., 2005
2. **"Mechanics of materials",** James.M.Gere, Thomson, Fifth edition 2004.
3. **"Mechanics of materials",** in SI Units, Ferdinand Beer & Russell Johston, 5th Ed., TATA McGraw Hill- 2003.

REFERENCE BOOKS:

1. **"Strength of Materials",** S.S. Rattan, Tata McGraw Hill, 2009
2. **"Strength of Materials",** S.S.Bhavikatti, Vikas publications House -1 Pvt. Ltd., 2nd Ed., 2006.
3. **"Mechanics of Materials",** K.V. Rao, G.C. Raju, First Edition, 2007
4. **"Engineering Mechanics of Solids**", Egor.P. Popov, Pearson Edu. India, 2nd, Edition, 1998.
5. **"Strength of Materials",** W.A. Nash, 5th Ed., Schaum's Outline Series, Fourth Edition-2007.

MANUFACTURING PROCESS – I
(FUNDAMENTALS OF FOUNDRY & WELDING)

Subject Code	**: 10ME35**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

CASTING PROCESS

UNIT - 1

Introduction: Concept of Manufacturing process, its importance. Classification of Manufacturing processes. Introduction to Casting process & steps involved. Varieties of components produced by casting process. Advantages & Limitations of casting process.

Patterns: Definition, functions, Materials used for pattern, various pattern allowances and their importance. Classification of patterns, BIS color coding of Patterns.

Binder: Definition, Types of binder used in moulding sand.

Additives: Need, Types of additives used and their properties..

06 Hours

UNIT - 2

Sand Moulding : Types of base sand, requirement of base sand. Moulding sand mixture ingredients for different sand mixtures. Method used for sand moulding, such as Green sand, dry sand and skin dried moulds.

Cores: Definition, Need, Types. Method of making cores, Binders used, core sand moulding.

Concept of Gating & Risers. Principle and types.

Fettling and cleaning of castings. Basic steps, Casting defects, Causes, features and remedies.

Moulding Machines : Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger.

07 Hours

UNIT - 3

Special moulding Process: Study of important moulding processes, No bake moulds, Flaskless moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould.

Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes.

07 Hours

UNIT - 4

Melting Furnaces: Classification of furnaces. Constructional features & working principle of coke fired, oil fired and Gas fired pit furnace, Resistance furnace, Coreless Induction furnace, Electric Arc Furnace, Cupola furnace.

06 Hours

PART – B

WELDING

UNIT - 5

Welding process: Definition, Principles, Classification, Application, Advantages & limitations of welding.

Arc Welding: Principle, Metal Arc welding **(MAW)**, Flux Shielded Metal Arc Welding **(FSMAW)**, Inert Gas Welding **(TIG & MIG)** Submerged Arc Welding **(SAW)** and Atomic Hydrogen Welding processes. **(AHW)**

Gas Welding: Principle, Oxy – Acetylene welding, Chemical Reaction in Gas welding, Flame characteristics. Gas torch construction & working. Forward and backward welding.

07 Hours

UNIT - 6

Special types of welding: Resistance welding - principles, Seam welding, Butt welding, Spot welding and projection welding.

Friction welding, Explosive welding, Thermit welding, Laser welding and Electron beam welding.

07 Hours

UNIT - 7

Metallurgical aspect, in welding : Structure of welds, Formation of different zones during welding. Heat affected zone **(HAZ).** Parameters affecting **HAZ**. Effect of carbon content on structure and properties of steel. Shrinkage in welds & Residual stresses.

Concept of electrodes, Filler rod and fluxes. Welding defects – Detection causes & remedy.

06 Hours

UNIT - 8

Principles of soldering & brazing: Parameters involved & Mechanism. Different Types of Soldering & Brazing Methods.

Inspection Methods – Methods used for Inspection of casting and welding. Visual, Magnetic particle, Fluorescent particle, Ultrasonic, Radiography, Eddy current, Holography methods of Inspection.

06 Hours

TEXT BOOKS:

1. **"Manufacturing Process-I",** Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2009.
2. **"Manufacturing & Technology**: Foundry Forming and Welding", P.N.Rao, 3rd Ed., Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **"Process and Materials of Manufacturing**", Roy A Lindberg, 4th Ed. Pearson Edu. 2006.
2. **"Manufacturing Technology**", Serope Kalpakjian, Steuen. R. Sechmid, Pearson Education Asia, 5th Ed. 2006.

COMPUTER AIDED MACHINE DRAWING

Subject Code	**:10ME36A/10ME46A**	**IA Marks**	**: 25**
Hours/Week	**: 04(1 Hrs. Theory & 3 Hrs Practical)**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

Introduction:
Review of graphic interface of the software. Review of basic sketching commands and navigational commands. Starting a new drawing sheet. Sheet sizes. Naming a drawing, Drawing units, grid and snap.

02 Hours

PART-A

UNIT - 1
Sections of Solids: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids). True shape of sections.
Orthographic Views: Conversion of pictorial views into orthographic projections. of **simple machine parts** with or without section. (Bureau of Indian Standards conventions are to be followed for the drawings) Hidden line conventions. Precedence of lines.

08 Hours

UNIT - 2
Thread Forms: Thread terminology, sectional views of threads. ISO Metric (Internal & External) BSW (Internal & External) square and Acme. Sellers thread, American Standard thread.
Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.

08 Hours

PART-B

UNIT - 3

Keys & Joints :

Parallel key, Taper key, Feather key, Gibhead key and Woodruff key

Riveted Joints: Single and double riveted lap joints, butt joints with single/double cover straps (Chain and Zigzag, using snap head rivets). cotter joint (socket and spigot), knuckle joint (pin joint) for two rods.

08 Hours

UNIT - 4

Couplings:

Split Muff coupling, Protected type flanged coupling, pin (bush) type flexible coupling, Oldham's coupling and universal coupling (Hooks' Joint)

08 Hours

PART - C
Assembly Drawings
(Part drawings should be given)

1. Plummer block (Pedestal Bearing)
2. Rams Bottom Safety Valve
3. I.C. Engine connecting rod
4. Screw jack (Bottle type)
5. Tailstock of lathe
6. Machine vice
7. Tool Head of a shaper

18 Hours

TEXT BOOKS:

1. **'A Primer on Computer Aided Machine Drawing-2007'**, Published by VTU, Belgaum.
2. **'Machine Drawing'**, N.D.Bhat & V.M.Panchal

REFERENCE BOOKS:

1. **'A Text Book of Computer Aided Machine Drawing'**, S. Trymbaka Murthy, CBS Publishers, New Delhi, 2007
2. **'Machine Drawing'**, K.R. Gopala Krishna, Subhash Publication.

3. **'Machine Drawing with Auto CAD'**, Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005
4. **'Auto CAD 2006, for engineers and designers'**, Sham Tickoo. Dream tech 2005
5. **'Machine Drawing'**, N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2006

NOTE:

Internal assessment: 25 Marks

All the sheets should be drawn in the class using software. Sheet sizes should be A3/A4. All sheets must be submitted at the end of the class by taking printouts.

Scheme of Examination:

Two questions to be set from each Part-A, Part-B and Part-C

Student has to answer one question each from Part-A and Part-B for 20 marks each. And one question from Part-C for 60 marks.

i.e.	**PART-A 1 x 20**	**= 20 Marks**
	PART-B 1 x 20	**= 20 Marks**
	PART-C 1 x 60	**= 60 Marks**
	Total	**= 100 Marks**

FLUID MECHANICS

Subject Code	**: 10ME36B / 46B**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT-1

Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation

06 Hours

UNIT-2

Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid.

07 Hours

UNIT-3

Buoyancy and Fluid Kinematics:

Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically.

<u>Kinematics</u>: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function.

07 Hours

UNIT-4

Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation.

06 Hours

PART-B

UNIT-5

Fluid Flow Measurements : Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches.

<u>Dimensional Analysis</u> : Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

UNIT-6

Flow through pipes : Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL.

06 Hours

UNIT-7

Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates.

06 Hours

UNIT-8

Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness.
Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid.

07 Hours

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: Metropolitan Book Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S, Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning

METALLOGRAPHY AND MATERIAL TESTING LABORATORY

Subject Code	**: 10MEL37A / 47A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Preparation of specimen for Metallograpic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.
2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.
3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiments like,
   (a). Ultrasonic flaw detection
   (b). Magnetic crack detection
   (c). Dye penetration testing. To study the defects of Cast and Welded specimens

PART – B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing Machine
2. Torsion Test
3. Bending Test on metallic and nonmetallic specimens.
4. Izod and Charpy Tests on M.S, C.I Specimen.
5. Brinell, Rockwell and Vickers's Hardness test.
6. Fatigue Test.

<u>Scheme of Examination:</u>

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Subject Code	**: 10MEL37B / 47B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART-A: MECHANICAL MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

PART-B: METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Center / Sine bar / bevel protractor
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using
   a) Lathe tool Dynamometer
   b) Drill tool Dynamometer.
5. Measurement of Screw thread Parameters using Two wire or Three-wire method.
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flats

Scheme of Examination:

ONE question from part -A:	**20** Marks
ONE question from part -B:	**20** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

FOUNDRY AND FORGING LABORATORY

Subject Code	**: 10MEL38A / 48A**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

1. Testing of Moulding sand and Core sand

Preparation of sand specimens and conduction of the following tests:

1 Compression, Shear and Tensile tests on Universal Sand Testing Machine.

2 Permeability test

3 Core hardness & Mould hardness tests.

4 Sieve Analysis to find Grain Fineness number of Base Sand

5 Clay content determination in Base Sand

PART – B

2. Foundry Practice

Use of foundry tools and other equipments.

Preparation of moulds using two moulding boxes using patterns or without patterns. (Split pattern, Match plate pattern and Core boxes).

Preparation of one casting (Aluminum or cast iron-Demonstration only)

PART – C

3. Forging Operations :

- Calculation of length of the raw material required to do the model.
- Preparing minimum three forged models involving upsetting, drawing and bending operations.
- Out of these three models, at least one model is to be prepared by using Power Hammer.

<u>Scheme of Examination:</u>

One question is to be set from Part-A: 10 marks
One question is to be set from either
Part-B or Part-C: 30 marks
Calculation part in case of forging is made compulsory

Calculation (Forging)	+ Foundry Model	= 05 +25 = 30 Marks
Calculation (Forging)	+ Forging Model	= 05 +25 = 30 Marks

Viva-Voce	:	**10** marks.
Total	:	**50** Marks**.**

MACHINE SHOP

Subject Code	**: 10MEL38B / 48B**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 48**	**Exam Marks**	**: 50**

PART – A

Preparation of three models on lathe involving Plain turning, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.

PART – B

Cutting of V Groove/ dovetail / Rectangular groove using a shaper.
Cutting of Gear Teeth using Milling Machine.

<u>Scheme of Examination:</u>

ONE question from part -A:	**30** Marks
ONE question from part -B:	**10** Marks
Viva -Voice:	**10** Marks
Total :	**50** Marks

IV SEMESTER

ENGINEERING MATHEMATICS – IV

Sub Code	**:**	**10MAT41**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A

UNIT-1

Numerical Methods- 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

6 Hours

UNIT-2

Numerical Methods – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.

Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

6 Hours

UNIT-3

Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.

Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

7 Hours

UNIT-4

Complex variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals- Cauchy's theorem and Cauchy's integral formula.

7 Hours

PART-B

UNIT-5

Special Functions

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

7 Hours

UNIT-6

Probability Theory - 1

Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

6 Hours

UNIT-7

Probability Theory- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

7 Hours

UNIT-

Sampling Theory

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

6 Hours

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

REFERENCE BOOK:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

APPLIED THERMODYNAMICS

Subject Code	**: 10ME43**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Combustion thermodynamics: Theoretical (Stoichiometric) air and excess air for combustion of fuels. Mass balance, actual combustion. Exhaust gas analysis. A./ F ratio, Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion, Combustion efficiency, adiabatic flow temperature.

07 Hours

UNIT- 2

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.

06 Hours

UNIT - 3

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.

06 Hours

UNIT - 4

Vapour Power Cycles: Carnot vapour power cycles, drawbacks as a reference cycle, Simple Rankine cycle, description, T- S diagram, analysis for performance , comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycle, open and closed feed water heaters, Reheat Rankine cycle.

07 Hours

PART-B

UNIT - 5

Reciprocating Compressors: Operation of a single stage reciprocating compressors, work input through P-V diagram and steady state steady flow analysis. Effect of clearance and volumetric efficiency. Adiabatic, isothermal and mechanical efficiencies. Multistage compressor, saving in work, optimum intermediate pressure, inter- cooling, minimum work for compression.

06 Hours

UNIT - 6

Gas turbine and Jet propulsion: Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency, Jet propulsion and Rocket propulsion.

07 Hours

UNIT - 7

Refrigeration: Vapour compression refrigeration system ; description, analysis, refrigerating effect, capacity , power required, units of refrigeration, COP , Refrigerants and their desirable properties. Air cycle refrigeration;

reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system, steam jet refrigeration.

06 Hours

UNIT - 8

Psychometry: Atmospheric air and psychometric properties; Dry bulb temperature, wet bulb temperature, dew point temperature; partial pressures, specific and relative humidities and the relation between the two enthalpy and adiabatic saturation temperature. Construction and use of psychometric chart . Analysis of various processes; heating, cooling , dehumidifying and humidifying. Adiabatic mixing of moist air. Summer and winter air conditioning.

07 Hours

Data Hand Book :

1. **Thermodynamic data hand book,** B.T. Nijaguna.
2. **Properties of Refrigerant & Psychometric** (tables & Charts in SI Units), Dr. S.S. Banwait, Dr. S.C. Laroiya, Birla Pub. Pvt. Ltd., Delhi, 2008

TEXT BOOKS:

1. **Basic and applied Thermodynamics**, P.K. Nag, 2nd Ed., Tata McGraw Hill Pub.Co,2002
2. **Applied Thermodynamics**, Rajput, Laxmi Publication
3. **Applied Thermodynamics**, B.K. Venkanna, Swati B. Wadavadagi, PHI, New Delhi, 2010

REFERENCE BOOKS:

1. **Thermodynamics , An engineering approach**, Yunus, A. Cengel and Michael A.Boies, 6th Ed., Tata McGraw Hill pub. Co., 2002,
2. **Fundamental of Classical Thermodynamics,** G.J. Van Wylen and R.E. Sontang Wiley eastern.

KINEMATICS OF MACHINES

Subject Code	**: 10ME44**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Definitions Link or element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanism, Inversion, Machine.

Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain.

07 Hours

UNIT - 2

Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism.

Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms -Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism.

06 Hours

UNIT - 3

Velocity and Acceleration Analysis of Mechanisms (Graphical Methods)

Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles .in a common link, relative velocity and accelerations of coincident Particles on separate links- Coriolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing.

07 Hours

UNIT - 4

Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's Theorem, Determination of linear and angular velocity using instantaneous center method

Klein's Construction: Analysis of velocity and acceleration of single slider crank mechanism.

06 Hours

PART – B

UNIT - 5

Velocity and Acceleration Analysis of Mechanisms (Analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra)

06 Hours

UNIT - 6

Spur Gears: Gear terminology, law of gearing, Characteristics of involute action, Path of contact. Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Methods of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification.

07 Hours

UNIT - 7

Gear Trains: Simple gear trains, Compound gear trains for large speed. reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

07 Hours

UNIT - 8

Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

06 Hours

TEXT BOOKS:

1. **"Theory of Machines",** Rattan S.S, Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 3rd edition -2009.
2. **"Theory of Machines",** Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd, Indian Branch New Delhi, 2nd Edi. 2006

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms**", J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009.
2. **Mechanism and Machine theory**, Ambekar, PHI, 2007

Graphical Solutions may be obtained either on the Graph Sheets or on the Answer Book itself.

MANUFACTURING PROCESS – II
(Metal Removing Process)

Subject Code	**: 10ME45**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool Life equation. Problems on tool life evaluation.

07 Hours

UNIT - 2

Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics. Cutting fluids. Desired properties, types and selection. Heat generation in metal cutting, factors affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature.

07 Hours

UNIT - 3

Turning (Lathe), Shaping and Planing Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planing Machine, Driving mechanisms of lathe, shaping and planing machines, Different operations on lathe, shaping machine and planing machine. Simple problems on machining time calculations

07 Hours

UNIT - 4

Drilling machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials.

Introduction to CNC machines- Principles of operation. Axes of NC machine-Coordinate systems. Basics of Manual part programming methods.

06 Hours

PART – B

UNIT - 5

Milling machines: Classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.

Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing.

06 Hours

UNIT - 6

Grinding machines: Types of abrasives, Grain size, bonding process, grade and structure of grinding wheels, grinding wheel types. Classification, constructional features of grinding machines (Centerless, cylindrical and surface grinding). Selection of grinding wheel. Grinding process parameters. Dressing and truing of grinding wheels.

07 Hours

UNIT - 7:

Broaching process - Principle of broaching. Details of a broach. Types of broaching machines-constructional details. Applications. Advantages and Limitations.

Finishing and other Processes Lapping and Honing operations – Principles, arrangement of set up and application. Super finishing process, polishing, buffing operation and application.

06 Hours

UNIT - 8

Non-traditional machining processes: Need for non traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining.

06 Hours

TEXT BOOKS:

1. **Workshop Technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt. Ltd. 2004
2. **Production Technology,** R.K.Jain, Khanna Publications, 2003.
3. **Production Technology,** HMT, Tata Mc Graw Hill, 2001.

REFERENCE BOOKS:

1. **Manufacturing Science**, Amitabha Ghosh and Mallik, affiliated East West Press, 2003.
2. **Fundamentals of Metal Machining and Machine Tools,** G. Boothroyd, McGraw Hill, 2000.

V SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP

Subject Code	**: 10AL51**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

MANAGEMENT

UNIT - 1

Management: Introduction - Meaning - nature and characteristics of Management, Scope and Functional areas of management - Management as a science, art of profession - Management & Administration - Roles of Management, Levels of Management, Development of Management Thought - early management approaches – Modern management approaches.

7 Hours

UNIT - 2

Planning: Nature, importance and purpose of planning process Objectives - Types of plans (Meaning Only) - Decision making Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

Organizing And Staffing: Nature and purpose of organization Principles of organization - Types of organization - Departmentation Committees-Centralization Vs Decentralization of authority. and responsibility - Span of control - MBO and MBE (Meaning Only) Nature and importance of staffing--:Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

Directing & Controlling: Meaning and nature of directing Leadership styles, Motivation Theories, Communication - Meaning and importance - coordination, meaning and importance and Techniques of Co Ordination.

Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control (in brief):

7 Hours

PART-B

ENTREPRENEURSHIP

UNIT - 5

Entrepreneur: Meaning of Entrepreneur; Evolution of .the Concept; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging. Class. Concept of Entrepreneurship - Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship - its Barriers.

6 Hours

UNIT – 6

Small Scale Industries: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI - Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition Only)

7 Hours

UNIT - 7

Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.

6 Hours

UNIT - 8

Preparation Of Project: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; Formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

7 Hours

TEXT BOOKS:

1 **Principles of Management –** P. C.Tripathi, P.N. Reddy – Tata McGraw Hill,
2 **Dynamics of Entrepreneurial Development & Management** Vasant Desai - Himalaya Publishing House
3 **Entrepreneurship Development –** Poornima. M. Charantimath Small Business Enterprises - Pearson Education - 2006 (2 & 4).

REFERENCE BOOKS:

1 **Management Fundamentals** - Concepts, Application, Skill Development - Robers Lusier - Thomson
2 **Entrepreneurship Development** - S.S.Khanka - S.Chand & Co.
3 **Management** - Stephen Robbins - Pearson Education/PHI - 17^{th} Edition, 2003.

DESIGN OF MACHINE ELEMENTS-I

Subject Code	**: 10ME52**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT- 1

Introduction: Definitions: normal, shear, biaxial and tri axial stresses, Stress tensor, Principal Stresses. Engineering Materials and their mechanical properties, Stress-Strain diagrams, Stress Analysis, Design considerations: Codes and Standards.

05 Hours

UNIT- 2

Design For Static & Impact Strength:

Static Strength: Static loads and factor of safety, Theories of failure: Maximum normal stress theory, Maximum shear stress theory, Maximum strain theory, Strain energy theory, Distortion energy theory. Failure of brittle and ductile materials, Stress concentration, Determination of Stress concentration factor.

Impact Strength: Introduction, Impact stresses due to axial, bending and torsional loads, effect of inertia.

07 Hours

UNIT - 3

Design For Fatigue Strength: Introduction- S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit, Modifying factors: size effect, surface effect, Stress concentration effects, Fluctuating stresses, Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage.

08 Hours

UNIT - 4

Threaded Fasteners: Stresses in threaded fasteners, Effect of initial tension, Design of threaded fasteners under static, dynamic and impact loads, Design of eccentrically loaded bolted joints.

06 Hours

PART – B

UNIT - 5

Design Of Shafts: Torsion of shafts, design for strength and rigidity with steady loading, ASME codes for power transmission shafting, shafts under fluctuating loads and combined loads.

07 Hours

UNIT - 6

Cotter And Knuckle Joints, Keys And Couplings: Design of Cotter and Knuckle joints, Keys: Types of keys, Design of keys, Couplings: Rigid and flexible couplings, Flange coupling, Bush and Pin type coupling and Oldham's coupling.

07 Hours

UNIT - 7

Riveted and Welded Joints – Types, rivet materials, failures of riveted joints, Joint Efficiency, Boiler Joints, Lozanze Joints, Riveted Brackets. Welded Joints – Types, Strength of butt and fillet welds, eccentrically loaded welded joints.

07 Hours

UNIT - 8

Power Screws: Mechanics of power screw, Stresses in power screws, efficiency and self-locking, Design of Power Screw, Design of Screw Jack: (Complete Design).

05 Hours

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2009.
2. **Design of Machine Elements,** V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007.

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book,** K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

REFERENCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Fundamentals of Machine Component Design,** Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007.

ENERGY ENGINEERING

Subject Code	**: 10ME53**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant: Different Types of Fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverized fuel, Equipment for preparation and burning of pulverized coal, unit system and bin system. Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generation of steam using forced circulation, high and supercritical pressures.

07 Hours

UNIT - 2

A Brief Account Of Benson, Velox Schmidt Steam Generators. Chimneys: Natural, forced, induced and balanced draft, Calculations and numericals involving height of chimney to produce a given draft. Cooling towers and Ponds. Accessories for the Steam generators such as Superheaters, De-superheater, control of superheaters, Economizers, Air pre-heaters and re-heaters.

07 Hours

UNIT - 3

Diesel Engine Power Plant: Applications of Diesel Engines in Power field. Method of starting Diesel engines. Auxiliaries like cooling and lubrication system, filters, centrifuges, Oil heaters, intake and exhaust system, Layout of diesel power plant.

06 Hours

UNIT - 4

Hydro-Electric Plants: Hydrographs, flow duration and mass curves, unit hydrograph and numericals. Storage and pondage, pumped storage plants, low, medium and high head plants, Penstock, water hammer, surge tanks, gates and valves. General layout of hydel power plants.

06 Hours

PART – B

UNIT - 5

Nuclear Power Plant: Principles of release of nuclear energy; Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the nuclear reactor; moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types-Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Fast Breeder reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Shieldings, Radio active waste disposal.

06 Hours

UNIT - 6

Solar Energy: Solar Extra terrestrial radiation and radiation at the earth surface, radiation-measuring instruments, working principles of solar flat plate collectors, solar pond and photovoltaic conversion (Numerical Examples).

Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; Types of wind machines and their characteristics, horizontal and vertical axis wind mills, coefficient of performance of a wind mill rotor (Numerical Examples).

08 Hours

UNIT - 7

Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion: Principle of working, Rankine cycle, problems associated with OTEC.

Geothermal Energy Conversion: Principle of working, types of geothermal station with schematic diagram, problems associated with geothermal conversion, scope of geothermal energy.

06 Hours

UNIT - 8

Energy From Bio Mass: Photosynthesis, photosynthetic oxygen production, energy plantation.

Bio Chemical Route: Biogas production from organic wastes by anaerobic fermentation, classification of bio gas plants, factors affecting bio gas generation.

Thermo Chemical Route: Thermo chemical conversion on bio mass, types of gasifiers.

06 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P. K. Nag Tata McGraw Hill 2nd edn 2001.
2. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons. 2003

REFERENCE BOOKS:

1. **Power Plant Engineering,** R. K. Rajput, Laxmi publication, New Delhi.
2. **Principles of Energy conversion**, A. W. Culp Jr., McGraw Hill. 1996
3. **Non conventional Energy sources**, G D Rai Khanna Publishers.
4. **Non conventional resources,** B H Khan TMH - 2007

DYNAMICS OF MACHINES

Subject Code	**: 10ME54**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Static Force Analysis: Introduction: Static equilibrium. Equilibrium of two and three force members. Members with two forces and torque. Free body diagrams. Principle of virtual work. Static force analysis of four bar mechanism and slider-crank mechanism with and without friction.

06 Hours

UNIT – 2

Dynamic Force Analysis: D'Alembert's principle, Inertia force, inertia torque. Dynamic force analysis of four-bar mechanism and slider crank mechanism. Dynamically equivalent systems. Turning moment diagrams and flywheels. Fluctuation of Energy. Determination of size of flywheels.

08 Hours

UNIT - 3

Friction and Belt Drives: Definitions: Types of friction: laws of friction, Friction in pivot and collar bearings. Belt drives: Flat belt drives. ratio of belt tensions, centrifugal tension, power transmitted.

06 Hours

UNIT – 4

Balancing of Rotating Masses: Static and dynamic balancing. Balancing of single rotating mass by balancing masses in same plane and in different planes. Balancing of several rotating masses by balancing masses in same plane and in different planes.

06 Hours

PART – B

UNIT – 5

Balancing of Reciprocating Masses: Inertia effect of crank and connecting rod, single cylinder engine, balancing in multi cylinder-inline engine (primary & secondary forces), V-type engine; Radial engine – Direct and reverse crank method.

08 Hours

UNIT – 6

Governors: Types of governors; force analysis of Porter and Hartnell governors. Controlling force. stability, sensitiveness. Isochronism, effort and power.

06 Hours

UNIT – 7

Gyroscope: Vectorial representation of angular motion. Gyroscopic couple. Effect of gyroscopic couple on ship, plane disc, aeroplane, stability of two wheelers and four wheelers.

06 Hours

UNIT – 8

Analysis of Cams: Analysis of Tangent cam with roller follower and Circular arc cam operating flat faced and roller followers. Undercutting in Cams

06 Hours

TEXT BOOKS:

1. **Theory of Machines**, Sadhu Singh, Pearson Education. 2nd edition. 2007.
2. **Theory of Machines**, Rattan S.S. Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2009.

REFERENCE BOOKS:

1. **"Theory of Machines & Mechanisms",** J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed. 2009
2. **Mechanism and Machine Theory**, A.G.Ambekar PHI, 2007

MANUFACTURING PROCESS – III

(METAL FORMING PROCESS)

Subject Code	**: 10ME55**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction And Concepts: Classification of metal working processes, characteristics of wrought products, advantages and limitations of metal working processes.Concepts of true stress, true strain, triaxial & biaxial stresses. Determination of flow stress. Principal stresses, Tresca & Von-Mises yield criteria, concepts of plane stress & plane strain.

07 Hours

UNIT - 2

Effects Of Parameters: Temperature, strain rate, friction and lubrication, hydrostatic pressure in metalworking, Deformation zone geometry, workability of materials, Residual stresses in wrought products.

06 Hours

UNIT - 3

Forging: Classification of forging processes. Forging machines & equipment. Expressions for forging pressures & load in open die forging and closed die forging by slab analysis, concepts of friction hill and factors affecting it. Die-design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Simple problems.

07 Hours

UNIT - 4

Rolling: Classification of Rolling processes. Types of rolling mills, expression for RoIling load. Roll separating force. Frictional losses in bearing, power required in rolling, Effects of front & back tensions, friction, friction hill. Maximum possible reduction. Defects in rolled products. Rolling variables, simple problems.

06 Hours

PART - B

UNIT - 5

Drawing: Drawing equipment & dies, expression for drawing load by slab analysis, power requirement. Redundant work and its estimation, optimal cone angle & dead zone formation, drawing variables, Tube drawing, classification of tube drawing, simple problems.

07 Hours

UNIT - 6

Extrusion: Types of extrusion processes, extrusion equipment & dies, deformation, lubrication & defects in extrusion. Extrusion dies, Extrusion of seamless tubes. Extrusion variables, simple problem

06 Hours

UNIT - 7

Sheet & Metal Forming: Forming methods, dies & punches, progressive die, compound die, combination die. Rubber forming. Open back inclinable press (OBI press), piercing, blanking, bending, deep drawing, LDR in drawing, Forming limit criterion, defects of drawn products, stretch forming. Roll bending & contouring, Simple problems

06 Hours

UNIT - 8

High Energy Rate Forming Methods: Principles, advantages and applications, explosive forming, electro hydraulic forming, Electromagnetic forming.

Powder Metallurgy: Basic steps in Powder metallurgy brief description of methods of production of metal powders, conditioning and blending powders, compaction and sintering application of powder metallurgy components, advantages and limitations.

07 Hours

TEXT BOOKS:

1. **Mechanical metallurgy (SI units),** G.E. Dieter, Mc Graw Hill pub.2001
2. **Manufacturing Process – III,** Dr. K.Radhakrishna, Sapna Book House, 2009.

REFERENCE BOOKS:

1. **Materials and Processes in Manufacturing,** E.paul, Degramo, J.T. Black, Ronald, A.K. Prentice -hall of India 2002
2. **Principles of Industrial metal working process,** G.W. Rowe, CBSpub. 2002
3. **Manufacturing Science,** Amitabha Ghosh & A.K. Malik - East - Westpress 2001
4. **Technology of Metal Forming Process**, Surendra kumar, PHI – 2008

TURBO MACHINES

Subject Code	**: 10ME56**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Definition of turbomachine, parts of turbomachines, Comparison with positive displacement machines, Classification, Dimensionless parameters and their significance, Effect of Reynold's number, Unit and specific quantities, model studies. Application of first and second law's of thermodynamics to turbomachines, Efficiencies of turbomachines. Problems.

07 Hours

UNIT – 2

Thermodynamics of fluid flow: Static and Stagnation states- Incompressible fluids and perfect gases, Overall isentropic efficiency, stage efficiency (their comparison) and polytropic efficiency for both compression and expansion processes. Reheat factor for expansion process.

07 Hours

UNIT – 3

Energy exchange in Turbomachines: Euler's turbine equation, Alternate form of Euler's turbine equation, Velocity triangles for different values of degree of reaction, Components of energy transfer, Degree of Reaction, utilization factor, Relation between degree of reaction and Utilization factor, Problems.

06 Hours

UNIT – 4

General Analysis of Turbomachines: Radial flow compressors and pumps – general analysis, Expression for degree of reaction, velocity triangles, Effect of blade discharge angle on energy transfer and degree of reaction, Effect of blade discharge angle on performance, Theoretical head – capacity relationship, General analysis of axial flow pumps and compressors, degree of reaction, velocity triangles, Problems.

06 Hours

PART – B

UNIT – 5

Steam Turbines: Classification, Single stage impulse turbine, condition for maximum blade efficiency, stage efficiency, Need and methods of compounding, Multi-stage impulse turbine, expression for maximum utilization factor, Reaction turbine – Parsons's turbine, condition for maximum utilization factor, reaction staging. Problems.

07 Hours

UNIT – 6

Hydraulic Turbines: Classification, Different efficiencies, Pelton turbine – velocity triangles, design parameters, Maximum efficiency. Francis turbine - velocity triangles, design parameters, runner shapes for different blade speeds. Draft tubes- Types and functions. Kaplan and Propeller turbines - velocity triangles, design parameters. Problems.

07 Hours

UNIT – 7

Centrifugal Pumps: Classification and parts of centrifugal pump, different heads and efficiencies of centrifugal pump, Minimum speed for starting the flow, Maximum suction lift, Net positive suction head, Cavitation, Need for priming, Pumps in series and parallel. Problems.

06 Hours

UNIT – 8

Centrifugal Compressors: Stage velocity triangles, slip factor, power input factor, Stage work, Pressure developed, stage efficiency and surging and problems.

Axial flow Compressors: Expression for pressure ratio developed in a stage, work done factor, efficiencies and stalling. Problems.

06 Hours

(Note: Since dimensional analysis is covered in Fluid Mechanics subject, questions on dimensional analysis may not be given. However, dimensional parameters and model studies may be given more weightage.**)**

TEXT BOOKS:

1. **An Introduction to Energy Conversion**, Volume III, Turbo machinery, **V**. Kadambi and Manohar Prasad, New Age International Publishers, reprint 2008.
2. **Turbines, Compressors & Fans**, S. M. Yahya, Tata McGraw Hill Co. Ltd., 2nd edition, 2002

REFERENCE BOOKS:

1. **Principals of Turbomachines**, D. G. Shepherd, The Macmillan Company (1964).
2. **Fluid Mechanics & Thermodynamics of Turbomachines**, S. L. Dixon, Elsevier (2005).
3. **Turbomachine**, B.K.Venkanna PHI, New Delhi 2009.

4. **Text Book of Turbomachines,** M. S. Govindgouda and A. M. Nagaraj, M. M. Publications, 4Th Ed, 2008.

FLUID MECHANICS AND MACHINES LABORATORY

Subject Code	**: 10MEL57**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of coefficient of friction of flow in a pipe.

2. Determination of minor losses in flow through pipes.

3. Determination of force developed by impact of jets on vanes.

4. Calibration of flow measuring devices

a. Orifice Plate meter
b. Nozzle
c. Venturimeter
d. V-notch

18 Hours

PART - B

5. Performance testing of Turbines
   a. Pelton wheel
   b. Francis Turbine
   c. Kaplan Turbines

6. Performance testing of Pumps
   a. Single stage / Multi stage centrifugal pumps
   b. Reciprocating pump

7. Performance test of a two stage Reciprocating Air Compressor

8. Performance test on an Air Blower

24 Hours

Scheme for Examination:

One Question from Part A	-	15 Marks (05 Writeup + 10)
One Question from Part B	-	25 Marks (05 Writeup + 20)
Viva-Voce	-	10 Marks

	Total	**50 Marks**

ENERGY CONVERSION ENGINEERING LABORATORY

Subject Code	**: 10MEL58**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten's (closed) / Cleavland's (Open Cup) Apparatus.

2. Determination of Calorific value of solid, liquid and gaseous fuels.

3. Determination of Viscosity of a lubricating oil using Redwoods, Saybolt and Torsion Viscometers.

4. Valve Timing/port opening diagram of an I.C. engine (4 stroke/2 stroke).

5. Use of planimeter

21 Hours

PART - B

1. Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for

   (a) Four stroke Diesel Engine

   (b) Four stroke Petrol Engine

   (c) Multi Cylinder Diesel/Petrol Engine, (Morse test)

   (d) Two stroke Petrol Engine

   (e) Variable Compression Ratio I.C. Engine.

21 Hours

Scheme for Examination:

One Question from Part A	-	15 Marks (05 Writeup+10)
One Question from Part B	-	25 Marks (05 Writeup+20)
Viva-Voce	-	10 Marks

Total		**50 Marks**

VI SEMESTER

COMPUTER INTEGRATED MANUFACTURING

Subject Code	**: 10ME61**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT - 1

Computer Integrated Manufacturing Systems: Introduction, Automation definition, Types of automation, CIM, processing in manufacturing, Production concepts, Mathematical Models-Manufacturing lead time, production rate, components of operation time, capacity, Utilization and availability, Work-in-process, WIP ratio, TIP ratio, Problems using mathematical model equations.

8 Hours

UNIT - 2

High Volume Production System: Introduction Automated flow line-symbols, objectives, Work part transport-continuous, Intermittent, synchronous, Pallet fixtures, Transfer Mechanism-Linear-Walking beam,. roller chain drive, Rotary-rack and pinion, Rachet & Pawl, Geneva wheel, Buffer storage, control functions-sequence, safety, Quality, Automation for machining operation.

6 Hours

UNIT - 3

Analysis Of Automated Flow Line & Line Balancing: General terminology and analysis, Analysis of Tranfer Line without storage upper bound approach, lower bound approach and problems, Analysis of Transfer lines with storage buffer, Effect of storage, buffer capacity with simple problem, Partial automation-with numerical problems, flow lines with more than two stages, Manual Assembly lines, line balancing problem.

6 Hours

UNIT - 4

Minimum Rational Work Element: Work station process time, Cycle time, precedence constraints. Precedence diagram, Balance delay methods of line balancing-largest Candidate rule, Kilbridge and Westers method, Ranked positional weight method, Numerical problems covering all above methods and computerized line balancing.

6 Hours

PART-B

UNIT - 5

Automated Assembly Systems: Design for automated assembly systems, types of automated assembly system, Parts feeding devices-elements of parts delivery system-hopper, part feeder, Selectors, feed back, escapement and placement analysis of Multistation Assembly Machine analysis of single station assembly. **Automated Guided Vehicle System:** Introduction, Vehicle guidance and routing, System management, Quantitative analysis of AGV's with numerical problems and application.

8 Hours

UNIT - 6

Computerized Manufacturing Planning System: Introduction, Computer Aided Process Planning, Retrieval types of process planning, Generative type of process planning, Material requirement planning, Fundamental concepts of MRP inputs to MRP, Capacity planning.

6 Hours

UNIT - 7

Cnc Machining Centers: Introduction to CNC, elements of CNC, CNC machining centers, part programming, fundamental steps involved in development of part programming for milling and turning.

6 Hours

UNIT - 8

Robotics: Introduction to Robot configuration, Robot motion, programming of Robots end effectors, Robot sensors and Robot applications.

6 Hours

TEXT BOOKS:

2. **Automation, Production system & Computer Integrated manufacturing,** M. P. Groover Person India, 2007 2nd edition.
3. **Principles of Computer Integrated Manufacturing**, S. Kant Vajpayee, Prentice Hall India.

REFERENCE BOOKS:

1. **Computer Integrated Manufacturing**, J. A. Rehg & Henry. W. Kraebber.
2. **CADlCAM** by Zeid, Tata McGraw Hill.

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DESIGN OF MACHINE ELEMENTS – II

Subject Code	**: 10ME62**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Curved Beams: Stresses in curved beams of standard cross sections used in crane hook, punching presses & clamps, closed rings and links
Cylinders & Cylinder Heads: Review of Lame's Equations; compound cylinders, stresses due to different types of fits, cylinder heads, flats.

08 Hours

UNIT - 2

Belts Ropes and Chains: Flat belts: Length & cross section, Selection of V-belts, ropes and chains for different applications.

05 Hours

UNIT - 3

Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs.

Equalized stresses, Energy stored in springs, Torsion, Belleville and Rubber springs.

08 Hours

UNIT - 4

Spur & Helical Gears: Spur Gears: Definitions, stresses in gear tooth: Lewis equation and form factor, Design for strength, Dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads.

07 Hours

PART – B

UNIT - 5

Bevel and Worm Gears: Bevel Gears: Definitions, formative number of teeth, Design based on strength, dynamic and wear loads. Worm Gears: Definitions, Design based on strength, dynamic, wear loads and efficiency of worm gear drives.

07 Hours

UNIT - 6

Clutches & Brakes: Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes: Heat generation in Brakes.

05 Hours

UNIT - 7

Lubrication and Bearings: Lubricants and their properties, Mechanisms of Lubrication bearing modulus, coefficient of friction, minimum oil film thickness, Heat Generated, Heat dissipated, Bearing Materials, Examples of journal bearing and thrust bearing design.

07 Hours

UNIT - 8

IC Engine Parts: Design of piston, connecting rod and crank shaft.

05 Hours

DESIGN DATA HANDBOOK:

1. **Design Data Hand Book** , K. Lingaiah, McGraw Hill, 2nd Ed.
2. **Data Hand Book,** K. Mahadevan and Balaveera Reddy, CBS Publication
3. **Design Data Hand Book,** H.G. Patil, I. K. International Publisher, 2010.

TEXT BOOKS:

1. **Mechanical Engineering Design,** Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition 2003.
2. **Design of Machine Elements,** V. B Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

REFERNCE BOOKS:

1. **Machine Design,** Robert L. Norton, Pearson Education Asia, 2001.
2. **Design of Machine Elements,** M. F. Spotts, T. E. Shoup, L. E. Hornberger, S. R. Jayram and C. V. Venkatesh, Pearson Education, 2006.
3. **Machine Design,** Hall, Holowenko, Laughlin (Schaum's Outlines series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008.
4. **Machine Design,** A CAD Approach: Andrew D DIMAROGONAS, John Wiley Sons, Inc, 2001.

HEAT AND MASS TRANSFER

Subject Code	**: 10ME63**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introductory Concepts And Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer;

combined heat transfer mechanism. Boundary conditions of 1^{st}, 2^{nd} and 3^{rd} kind

Conduction: Derivation of general three dimensional conduction equation in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance.

07 Hours

UNIT - 2

Variable Thermal Conductivity: Derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation, Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation, Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems.

06 Hours

UNIT - 3

One-Dimensional Transient Conduction: Conduction in solids with negligible internal temperature gradient (Lumped system analysis), Use of Transient temperature charts (Heisler's charts) for transient conduction in slab, long cylinder and sphere; use of transient temperature charts for transient conduction in semi-infinite solids. Numerical Problems.

06 Hours

UNIT - 4

Concepts And Basic Relations In Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number; general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; Average heat transfer coefficient; Nusselt number. Flow inside a duct- velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numericals based on empirical relation given in data handbook.

Free Or Natural Convection: Application of dimensional analysis for free convection- physical significance of Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems.

07 Hours

PART – B

UNIT - 5

Forced Convections: Applications of dimensional analysis for forced convection. Physical significance of Reynolds, Prandtl, Nusselt and Stanton numbers. Use of various correlations for hydro dynamically and thermally developed flows inside a duct, use of correlations for flow over a flat plate, over a cylinder and sphere. Numerical problems.

06 Hours

UNIT - 6

Heat Exchangers: Classification of heat exchangers; overall heat transfer coefficient, fouling and fouling factor; LMTD, Effectiveness-NTU methods of analysis of heat exchangers. Numerical problems.

06 Hours

UNIT - 7

Condensation And Boiling: Types of condensation (discussion only) Nusselt's theory for laminar condensation on a vertical flat surface; use of correlations for condensation on vertical flat surfaces, horizontal tube and horizontal tube banks; Reynolds number for condensate flow; regimes of pool boiling, pool boiling correlations. Numerical problems. Mass transfer definition and terms used in mass transfer analysis, Ficks First law of diffusion (no numericals).

07 Hours

UNIT - 8

Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer; Stefan-Boltzman law, Kirchoff's law, Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surfaces, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle;

Lambert's law; radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems.

07 Hours

TEXT BOOKS:

1. **Heat & Mass transfer,** Tirumaleshwar, Pearson education 2006
2. **Heat transfer-A basic approach,** Ozisik, Tata McGraw Hill 2002

REFERENCE BOOKS:

1. **Heat transfer, a practical approach,** Yunus A- Cengel Tata Mc Graw Hill
2. **Principles of heat transfer,** Kreith Thomas Learning 2001
3. **Fundamentals of heat and mass transfer,** Frenk P. Incropera and David P. Dewitt, John Wiley and son's.
4. **Heat transfer,** P.K. Nag, Tata McGraw Hill 2002.

FINITE ELEMENT METHODS

Subject Code	**: 10ME64**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART-A

UNIT-1

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General description of Finite Element Method, Application and limitations. Types of elements based on geometry. Node numbering, Half band width.

07 Hours

UNIT-2

Basic Procedure: Euler - Lagrange equation for bar, beam (cantilever / simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method.

07 Hours

UNIT-3

Interpolation Models: Interpolation polynomials- Linear, quadratic and cubic. Simplex complex and multiplex elements. 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element.

07 Hours

UNIT-4

Solution of 1-D Bars: Solutions of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-elimination technique.

06 Hours

PART-B

UNIT-5

Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements. numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases.

06 Hours

UNIT-6

Trusses: Stiffness matrix of Truss element. Numerical problems.

06 Hours

UNIT-7

Beams: Hermite shape functions for beam element, Derivation of stiffness matrix. Numerical problems of beams carrying concentrated, UDL and linearly varying loads.

06 Hours

UNIT-8

Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins.

07 Hours

TEXT BOOKS:

1. **Finite Elements in Engineering**, T.R.Chandrupatla, A.D Belegunde, 3^{rd} Ed PHI.
2. **Finite Element Method in Engineering**, S.S. Rao, 4th Edition, Elsevier, 2006.

REFERENCE BOOKS:

1. **“Finite Element Methods for Engineers”** U.S. Dixit, Cengage Learning, 2009
2. **Concepts and applications of Finite Element Analysis**, R.D. Cook D.S Maltus, M.E Plesha, R.J.Witt, Wiley 4^{th} Ed, 2009
3. **Finite Element Methods**, Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method**, J.N.Reddy, McGraw -Hill International Edition.

MECHATRONICS & MICROPROCESSOR

Subject Code	**: 10ME65**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction to Mechatronic Systems: Measurement and control systems Their elements and functions, Microprocessor based controllers.

06 Hours

UNIT - 2

Review of Transducers and Sensors: Definition and classification of transducers. Definition and classification of sensors. Principle of working and applications of light sensors, proximity sensors and Hall effect sensors.

07 Hours

UNIT - 3

Electrical Actuation Systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

06 Hours

UNIT - 4

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system. Processing Pulse-modulation.

07 Hours

PART – B

UNIT - 5

Introduction to Microprocessors: Evolution of Microprocessor, Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors.

Review of concepts - Boolean algebra, Logic Gates and Gate Networks, Binary & Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real, numbers, floating point notation, representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

07 Hours

UNIT - 6

Logic Function: Data word representation. Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

07 Hours

UNIT - 7

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

06 Hours

UNIT - 8

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085 and INTEL 4004 register organization.

06 Hours

TEXT BOOKS:

1. **Mechatronics,** W.Bolton, Longman, 2Ed, Pearson Publications, 2007.
2. **Microprocessor Architecture, Programming And Applications With 8085/8085A,** R.S. Ganokar, Wiley Eastern.

REFERENCE BOOKS:

1. **Mechatronics and Microprocessors,** K.P.Ramchandran, G.K.Vijayraghavan, M.S.Balasundran, Wiley, 1st Ed, 2009
2. **Mechatronics - Principles, Concepts and applications –** Nitaigour and Premchand Mahilik - Tata McGraw Hill- 2003.
3. **Mechatronics Principles & applications**, Godfrey C. Onwubolu, Elsevier..
4. **Introduction Mechatronics & Measurement systems**, David.G. Aliciatore & Michael. B. Bihistaned, Tata McGraw Hill, 2000.

HEAT & MASS TRANSFER LABORATORY

Subject Code	**: 10MEL67**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

1. Determination of Thermal Conductivity of a Metal Rod.
2. Determination of Overall Heat Transfer Coefficient of a Composite wall.
3. Determination of Effectiveness on a Metallic fin.
4. Determination of Heat Transfer Coefficient in a free Convection on a vertical tube.

5. Determination of Heat Transfer Coefficient in a Forced Convention Flow through a Pipe.
6. Determination of Emissivity of a Surface.

21 Hours

PART – B

1. Determination of Steffan Boltzman Constant.
2. Determination of LMDT and Effectiveness in a Parallel Flow and Counter Flow Heat Exchangers
3. Experiments on Boiling of Liquid and Condensation of Vapour
4. Performance Test on a Vapour Compression Refrigeration.
5. Performance Test on a Vapour Compression Air - Conditioner
6. Experiment on Transient Conduction Heat Transfer

21 Hours

<u>Scheme for Examination:</u>

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

COMPUTER AIDED MODELING AND ANALYSIS LABORATORY

Subject Code	**: 10MEL68**	**IA Marks**	**: 25**
Hours/Week	**: 03**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART - A

Study of a FEA package and modeling stress analysis of

a. Bars of constant cross section area, tapered cross section area and stepped bar

6 Hours

b. Trusses – (Minimum 2 exercises)

3 Hours

c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc (Minimum 6 exercises)

12 Hours

PART - B

a) Stress analysis of a rectangular plate with a circular hole

3 Hours

b) Thermal Analysis – 1D & 2D problem with conduction and convection boundary conditions(Minimum 4 exercises)

9 Hours

c) Dynamic Analysis
   1) Fixed – fixed beam for natural frequency determination
   2) Bar subjected to forcing function
   3) Fixed – fixed beam subjected to forcing function

9 Hours

REFERENCE BOOKS:

1. **A first course in the Finite element method,** Daryl L Logan, Thomason, Third Edition
2. **Fundaments of FEM,** Hutton – McGraw Hill, 2004
3. **Finite Element Analysis,** George R. Buchanan, Schaum Series

Scheme for Examination:

One Question from Part A	-	20 Marks (05 Write up +15)
One Question from Part B	-	20 Marks (05 Write up +15)
Viva-Voce	-	10 Marks

Total		**50 Marks**

ELECTIVE-I (GROUP - A)

THEORY OF ELASTICITY

Subject Code	**: 10ME661**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Definition And Notation: Stress, Stress at a Point, Equilibrium Equations, Principal Stresses, Mohr's Diagram, Maximum Shear Stress, Boundary Conditions.

6 Hours

UNIT - 2

Strain At A Point: Compatibility Equations, Principal Strains, Generalised Hooke's law, Methods of Solution of Elasticity Problems – Plane Stress-Plane Strain Problems.

7 Hours

UNIT - 3

Two Dimensional Problems: Cartesian co-ordinates – Airy's stress functions – Investigation of Airy's Stress function for simple beam problems – Bending of a narrow cantilever beam of rectangular cross section under edge load – method of Fourier analysis – pin ended beam under uniform pressure.

7 Hours

UNIT - 4

General Equations In Cylindrical Co-Ordinates: Thick cylinder under uniform internal and / or external pressure, shrink and force fit, stress concentration.

6 Hours

PART – B

UNIT - 5

Stresses In An Infinite Plate (with a circular hole) subjected to uniaxial and biaxial loads, stress concentration, stresses in rotating discs and cylinders.

7 Hours

UNIT - 6

Torsion Of Circular, Elliptical And Triangular Bars: membrane analogy, torsion of thin open sections and thin tubes.

6 Hours

UNIT - 7

Thermal Stresses: Thermo elastic stress strain relationship, Equations of equilibrium Thermal stresses in thin circular discs and in long circular cylinder, sphere.

7 Hours

UNIT - 8

Uniqueness Theorem: Principle of super position, reciprocal theorem, saint venant principle.

6 Hours

TEXT BOOKS:

1. **Advanced Mechanics of solids**, L. S. Srinath, Tata Mc. Graw Hill, 2003
2. **Theory of Elasticity,** S. P. Timoshenko and J. N Gordier, Mc.Graw Hill International, 3rd edition, 1972

REFERENCES BOOKS:

1. **Theory of Elasticity,** Dr. Sadhu Singh, Khanna Publications, 1988
2. **Elasticity, Theory, Applications & Numericals,** Martin H Sadd, Elsevier. 2005
3. **Applied Elasticity,** Seetharamu & Govindaraju, Interline Publishing
4. **Applied Elasticity,** C.T. WANG Sc. D. McGraw Hill Book Co.1953

MECHANICS OF COMPOSITE MATERIALS

Subject Code	**: 10ME662**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Composite Materials: Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites.

Applications: Automobile, Aircrafts. missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

06 Hours

UNIT - 2

Fiber Reinforced Plastic Processing: Lay up and curing, fabricating process, open and closed mould process, hand lay up techniques; structural laminate bag molding, production procedures for bag molding; filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding.

07 Hours

UNIT - 3

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli by Rule of mixture, Numerical problems. **Macro Mechanics of a Lamina:** Hooke's law for different types of materials, Number of elastic constants, Two - dimensional relationship of compliance and stiffness matrix.

07 Hours

UNIT – 4.

Macro Mechanics of a Lamina Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.

06 Hours

PART – B

UNIT – 5

Biaxial Strength Theories: Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.

06 Hours

UNIT – 6

Macro Mechanical Analysis of Laminate: Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation) , Special cases of laminates, Numerical problems**.**

06 Hours

UNIT - 7

Metal Matrix Composites: Reinforcement materials, types, characteristics and selection base metals selection. Need for production MMC's and its application.

Fabrication Process For MMC's: Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.

07 Hours

UNIT - 8

STUDY PROPERTIES OF MMC'S: Physical Mechanical, Wear, machinability and Other Properties. Effect of size, shape and distribution of particulate on properties.

07 Hours

TEXT BOOKS:

1. **Composite Science and Engineering,** K. K. Chawla Springer Verlag 1998.
2. **Mechanics of composite materials,** Autar K. Kaw CRC Press New York.

REFERENCE BOOKS:

1. **Fiber Reinforced Composites,** P. K. Mallick, Marcel Dekker,Inc
2. **Mechanics of Composite Materials**, Robert M. Jones, McGraw Hill Kogakusha Ltd.1998

3. **Composite materials hand book,** Meing Schwaitz," McGraw Hill book company.1984
4. **Principles of composite Material mechanics,** Ronald F. Gibron. McGraw Hill international, 1994.
5. **Mechanics of Composite Materials and Structures**, Madhujit Mukhopadhyay , Universities Press 2009

REFRIGERATION AND AIR CONDITIONING

Subject Code	**: 10ME663**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Methods Of Refrigeration: Ice refrigeration, evaporative refrigeration, air refrigeration, vapour refrigeration, dry ice refrigeration, thermo electric refrigeration, pulse tube refrigeration, thermoacoustic refrigeration.

06 Hours

UNIT – 2

Gas Cycle Refrigeration: Introduction , reverse Carnot cycle, Bell Coleman cycle, advantages & dis-advtanges of gas refrigeration system. Applications to aircraft refrigeration, Analysis of gas refrigeration and Numericals.

06 Hours

UNIT – 3

Multi Pressure Vapour Compression Systems: Multi stage compression, Multi evaporator systems, Cascade systems, calculation, production of solid carbon dioxide, System practices for multistage system.

07 Hours

UNIT - 4

Refrigerants: Types of Refrigerants, Comparative study of Ethane and Methane derivatives, selection of Refrigerants, Requirements of Refrigerants, Effects of lubricants in Refrigerants, substitutes of CFC Refrigerants, Mixture Refrigerants-azeotropic mixtures

07 Hours

PART – B

UNIT – 5

Equipments Used In Vapour Compression Refrigeration System: Compressors: Principle, types of compressors, capacity control. Condensers: Types and construction, Expansion devices: Types- Automatic expansion valve, Thermostatic expansion valves, capillary tube. Sizing Evaporator: Types & construction.

06 Hours

UNIT - 6

Vapour Absorption System: Common refrigerant absorbent combinations, Binary mixtures, Ammonia Water Absorption system, Actual vapour absorption cycle and its representation on enthalpy. composition diagram, calculations. Triple fluid vapour absorption refrigeration system. Water - Lithium Bromide absorption chiller.

07 Hours

UNIT - 7

Design Conditions: Outside design conditions, choice of inside conditions, comfort chart. Choice of supply design condition.

Load Calculations And Applied Psychometrics: Internal heat gains, system heat gains, break up of ventilation load and effective sensible heat factor, Bypass factor, cooling load estimate. Psychometric calculations for cooling. Selection of Air conditioning apparatus for cooling and dehumidification, evaporative cooling.

07 Hours

UNIT - 8

Transmission And Distribution Of Air: Room Air Distribution, Friction loss in ducts, dynamic losses in ducts, Air flow through simple Duct system, Duct design.

Controls In Refrigeration And Air Conditioning Equipments: High pressure and low pressure cut out, thermostats, pilot operated solenoid valve, motor controls, bypass control-Damper motor. VAV controls.

06 Hours

TEXT BOOKS:

1. '**Refrigeration and Air-Conditioning'** C. P. Arora, Tata McGraw Hill Publication, 2nd edition, 2001.
2. '**Refrigeration and Air-Conditioning'** W. F. Stoecker, Tata McGraw Hill Publication, 2nd edition, 1982.
3. **ASHRAE,** Hand Book, 2009

REFERENCE BOOKS:

1. '**Principles of Refrigeration'** Dossat, Pearson-2006.
2. **'Heating, Ventilation and Air Conditioning',** McQuistion, Wiley Students edition, 5th edition 2000.
3. **'Air conditioning'** PITA, 4th edition, pearson-2005
4. '**Refrigeration and Air-Conditioning'** Manohar prasad
5. '**Refrigeration and Air-Conditioning'** S C Arora & S Domkundwar, Dhanpat Rai Publication

DESIGN OF HEAT EXCHANGER

Subject Code	**: 10ME664**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction To Heat Exchanger Design: Types of heat exchangers and their applications. Flow arrangements and temperature distributions in transfer type of heat exchangers. Overall heat transfer coefficient;- Clean overall heat transfer coefficient, dirt factor dirt overall heat transfer coefficient, dirt factors for various process services. Basic design equation. Mean temperature difference Concept: - LMTD for parallel flow and counter flow arrangement, correction factor for LMTD for cross flow and multi – pass heat exchangers.

06 Hours

UNIT - 2

Shell And Tube Heat Exchangers: Constructional features. Applications. Effectiveness-NTU method for heat exchanger design/ analysis. Rating and sizing problem. Correlations for tube side pressure drop and heat transfer coefficients. Pressure drop and heat transfer coefficient correlations for shell side flow.

06 Hours

UNIT - 3

Effect Of By – Pass And Leakage Calculation Procedure For Shell And Tube Heat Exchanger: Heat balance equations: LMTD: reference temperature calculations: evaluation of fluid properties: flow assignments: tube side flow area calculations; viscosity correction factor, shell side equivalent diameter, calculation of shell side heat transfer coefficient, evaluation for wall temperature, evaluation of overall heat transfer coefficient, Calculation of surface area. Calculations of tube side and shell side pressure drops.

08 Hours

UNIT - 4

Steam Condensers: Specifications of other details as per TEMA standards. Flow arrangement for increased heat recovery: - lack of heat recovery in 1-2 exchangers true temperature difference in a 2-4 exchanger. Calculation procedure for steam condensers.

06 Hours

PART - B

UNIT - 5

Double Pipe Heat Exchangers: Constructional features. Applications. Design parameters :- tube side and shell side film coefficients cut and twist factor, fin efficiency, overall heat transfer coefficient, mean temperature difference, available surface area, fin geometry fin height, number of fins, tube side and shell side pressure drop. Calculation procedure for the design/ analysis of double pipe heat exchanger.

06 Hours

UNIT - 6

Compact Heat Exchangers: Introduction; definition of Geometric Terms: plate fin surface geometries and surface performance data; correlation of heat transfer and friction data; Goodness factor comparisons; specification of rating and sizing problems; calculation procedure for a rating problem.

06 Hours

UNIT - 7

Air-Cooled Heat Exchangers: Air as coolant for industrial processes; custom-built units; fin-tube systems for air coolers; fin-tube bundles; thermal rating; tube side flow arrangements; cooling air supply by fans; cooling air supply in natural draft towers.

06 Hours

UNIT - 8

Furnaces And Combustion Chambers: Introduction; process heaters and boiler; heat transfer in furnaces: - Heat source; Heat sink; refractory surfaces; heat transfer to the sink; Design methods: - Method of Lobo and Evans: Method of Wilson, Lobo and Hottel; The Orrok-Hudson equation; Wallenberg simplified method.

08 Hours

TEXT BOOKS:

1. **Process Heat Transfer**: Donald Q. Kern, Tata McGraw –Hill Edition (1997)
2. **Compact Heat Exchangers:** W. M. Kays & A. L. London, Mcgraw –Hill co. (1997)

REFERENCE BOOKS:

1. **Heat Transfer – A Basic Approach:** Necati Ozsisik, McGraw – Hill International edition (1985).
2. **Heat Exchanger Design Hand Book:** Volumes 2 and 3, edited by Ernst U schlunder. et. al Hemisphere Publishing Co. (1983)
3. **Heat exchanger-** Kokac Thermal- hydraulic and design analysis.

NON-TRADITIONAL MACHINING

Subject Code	**: 10ME665**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: History, Classification, comparison between conventional and Non-conventional machining process selection.

05 Hours

UNIT - 2

Ultrasonic Machining (Usm): Introduction, equipment, tool materials & tool size, abrasive slurry, cutting tool system design:- Effect of parameter: Effect of amplitude and frequency and vibration, Effect of abrasive grain diameter, effect of applied static load, effect of slurry, tool & work material, USM process characteristics: Material removal rate, tool wear, Accuracy, surface finish, applications, advantages & Disadvantages of USM.

08 Hours

UNIT - 3

Abrasive Jet Machining (AJM): Introduction, Equipment, Variables in AJM: Carrier Gas, Type of abrasive, size of abrasive grain, velocity of the abrasive jet, mean number. abrasive particles per unit volume of the carrier gas, work material, stand off distance (SOD), nozzle design, shape of cut. Process characteristics-Material removal rate, Nozzle wear, Accuracy & surface finish. Applications, advantages & Disadvantages of AJM. Water Jet Machining**:** Principal, Equipment, Operation, Application, Advantages and limitations of water Jet machinery

07 Hours

UNIT - 4

Electrochemical Machining (ECM): Introduction, study of ECM machine, elements of ECM process : Cathode tool, Anode work piece, source of DC power, Electrolyte, chemistry of the process, ECM Process characteristics **–** Material removal rate, Accuracy, surface finish, ECM Tooling: ECM tooling technique & example, Tool & insulation materials, Tool size Electrolyte flow arrangement, Handling of slug, Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations.

06 Hours

PART – B

UNIT - 5

Chemical Machining (Chm): Introduction, elements of process, chemical blanking process : Preparation of work piece, preparation of masters, masking with photo resists, etching for blanking, accuracy of chemical blanking, applications of chemical blanking, chemical milling (contour machining): process steps –masking, Etching, process characteristics of CHM: material removal rate, accuracy, surface finish, Hydrogen embrittlement, advantages & application of CHM.

06 Hours

UNIT - 6

Electrical Discharge Machining (Edm): Introduction, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear, EDM tool design, choice of machining operation, electrode material selection, under sizing and length of electrode, machining time. Flushing; pressure flushing, suction flushing, side flushing, pulsed flushing synchronized with electrode movement, EDM process characteristics: metal removal rate, accuracy, surface finish, Heat Affected Zone. Machine tool selection, Application, EDM accessories / applications, electrical discharge grinding, Traveling wire EDM.

08 Hours

UNIT - 7

Plasma Arc Machining (Pam): Introduction, equipment, non-thermal generation of plasma, selection of gas, Mechanism of metal removal, PAM parameters, process characteristics. Safety precautions, Applications, Advantages and limitations.

05 Hours

UNIT - 8

Laser Beam Machining (Lbm): Introduction, equipment of LBM mechanism of metal removal, LBM parameters, Process characteristics, Applications, Advantages & limitations.

Electron Beam Machining (Ebm): Principles, equipment, operations, applications, advantages and limitation of EBM.

07 Hours

TEXT BOOKS:

1. **Modern machining process,** Pandey and Shan, Tata McGraw Hill 2000
2. **New Technology,** Bhattacharya 2000

REFERENCE BOOKS:

1. **Production Technology,** HMT Tata McGraw Hill. 2001
2. **Modern Machining Process,** Aditya. 2002
3. **Non-Conventional Machining,** P.K.Mishra, The Institution of Engineers (India) Test book series, Narosa Publishing House – 2005.
4. **Metals Handbook: Machining Volume 16,** Joseph R. Davis (Editor), American Society of Metals (ASM)

KNOWLEDGE MANAGEMENT

Subject Code	**: 10ME666**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Knowledge Influences : Introduction, External influences on organizations, Changing nature of management, Types of organizations, Strategic management in organizations, Knowledge management, Knowledge management an emerging concept, Model of strategic knowledge management.

07 Hours

UNIT - 2

Introduction to Key Concepts : What is Management? Knowledge Management and business strategies, Knowledge intensive firms and Knowledge workers, Learning and Knowledge Management

06 Hours

UNIT - 3

Knowledge Creation and Loss : Innovation dynamics and knowledge processes, characterizing innovation processes, innovation as an interactive process, knowledge creation and Nonaka, the social dynamics of innovation networking processes, forgetting and unlearning knowledge

07 Hours

UNIT - 4

Developing and Managing Knowledge Repositories : Effective knowledge repositories, mapping the content structure, repository quality control, case studies (not for examination)

06 Hours

PART B

UNIT - 5

Design Knowledge Management System : Introduction, Structure-preserving design, Step 1: design system architecture, Step 2: identify target implementation platform, Step 3: specify architectural components, Step 4: specify application within architecture, design of prototypes, distributed architecture.

07 Hours

UNIT - 6

Socio-Cultural Issues : Introduction, significance of cross community knowledge processes, characterizing cross community knowledge processes, identity, knowledge, trust and social relations, classification of boundary types, facilitating/managing knowledge between communities

06 Hours

UNIT - 7

Knowledge Leadership : Introduction, contributions of disciplines to Knowledge Leadership, the generic attributes of knowledge leader, specific knowledge leadership roles, leading knowledge teams, leading a knowledge network, recruiting and selecting knowledge leaders

06 Hours

UNIT - 8

Information and Communication Technologies and Knowledge Management : Introduction, linking knowledge management and ICTs, objectivist perspectives on ICT – enabled knowledge management, practice based perspectives on ICT enabled KM, the importance of accounting for socio cultural factors in ICT enabled KM, debates regarding the role of ICTs in KM processes.

07 Hours

TEXT BOOKS:

1. **Knowledge Management,** Shelda Debowski, Wiley India, 2007.
2. **Knowledge Management in Organizations,** Donald Hislop**,** 2nd Ed., Oxford Universities Press, 2009

REFERENCE BOOKS:

1. **Knowledge Engineering and Management,** Guus Schreiber, et al, Universities Press India Pvt. Ltd., 2003
2. **Knowledge Management - Classic and contemporary works,**Daryl Morey, et. al., 2007

PROJECT MANAGEMENT

Subject Code	**: 10ME667**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction: Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles,

04 Hours

UNIT - 2

Project Selection And Prioritization – Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment – identifying potential projects, methods of selecting projects, financial mode / scoring models to select projects, prioritizing projects, securing and negotiating projects.

05 Hours

UNIT - 3

Planning Projects: Introduction, developing the project management plan, understanding stake holders, communication planning, project meeting management, communication needs of global and virtual project teams, communication technologies, Constructing Work Breakdown Structures – scope planning, scope definition, work breakdown structures (WBS), Using Microsoft project for work breakdown structures.

08 Hours

UNIT - 4

Scheduling Projects: purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt Chart, Using Microsoft Project for critical path schedules.

08 Hours

PART – B

UNIT - 5

Resourcing Projects: Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project ream composition issues, assign resource to each activity, resource overloads, critical chain project management (CCPM), compress the project schedule, Using Microsoft Project for resource allocation.

Budgeting Projects: Cost planning, cost estimating, cost budgeting, establishing cost control, using Microsoft Project for Project Budgets,

08 hours

UNIT - 6

Project Risk Planning: Risk Management Planning, risk identification, risk analysis, risk response planning, Project Quality Planning and Project Kickoff: Development of quality concepts, project quality management plan, project quality tools, kickoff project, baseline and communicate project management plan, using Microsoft Project for project baselines.

06 Hours

UNIT - 7

Performing Projects: Project supply chain management: - Plan purchasing and acquisitions, plan contracting, contact types, project partnering and collaborations, project supply chain management, Leading and Managing Project Teams – Acquiring, developing, managing and leading the project team, managing stakeholders, managing project conflicts.

07 Hours

UNIT - 8

Determining Project Progress and Results: Project Balanced Scorecard Approach, Internal project, customer, financial issues, Using Microsoft Project to monitor and control projects. Finishing the project: Terminate project early, finish projects on time, secure customer feedback and approval, knowledge management, perform administrative and contract closure, celebrate success and reward participant, provide ongoing support.

06 Hours

TEXT BOOKS:

1. **Project Management**, Timothy J Kloppenborg, Cengage Learning, Edition 2009.
2. **Project Management**, A systems approach to planning schuduing and controlling by Harold kerzner, CBS publication.

REFERENCE BOOKS:

1. **Project Management Refer,** Pennington Lawrence, Mc Graw hill
2. **Project Management,** A Moder Joseph and Phillips New Yark Van Nostrand, Reinhold.
3. **Project Management,** Bhavesh M. Patal, Vikas publishing House,

STATISTICAL QUALITY CONTROL

Subject Code	**: 10ME668**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: The Meaning of Quality and Quality Improvement; Brief History of Quality Methodology; Statistical Methods for Quality Control and Improvement; Total Quality Management (quality philosophy, links between quality and productivity, quality costs, legal aspects of quality implementing, quality improvement).

06 Hours

UNIT - 2

Modeling Process Quality: Mean, Median, Mode, Standard deviation, Calculating area, The Deming funnel experiment, Normal distribution tables, Finding the Z score, Central limit theorem.

06 Hours

UNIT - 3

Methods And Philosophy Of Statistical Process Control: Chance and assignable causes, Statistical Basis of the Control Charts (basic principles, choices of control limits, significance of control limits, sample size and sampling frequency, rational subgroups, analysis of pattern on control charts, warning limits, Average Run Length-ARL)

06 Hours

UNIT - 4

Control Charts For Variables: Control Charts for X-Bar and R- Charts, Type I and Type II errors, the probability of Type II error. Simple Numerical Problems

08 Hours

PART – B

UNIT - 5

Process Capability: The foundation of process capability, Natural Tolerance limits, c_p – process capability index, c_{pk}, p_p – process performance index, summary of process measures. Numerical problems

06 Hours

UNIT 6: Control Charts For Attributes: Binomial distribution, Poisson distribution (from the point of view of Quality control) Control Chart for Fraction Nonconforming, Control Chart for number Nonconforming, Control Charts for Nonconformities or Defects, Control Chart for Number of non conformities per unit. Numerical problems

07 Hours

UNIT - 7

Lot-By-Lot Acceptance Sampling For Attributes: The acceptance sampling problem, single sampling plan for attributes, Double, Multiple, and Sequential sampling, AOQL, LTPD, OC curves, Military Standard 105E, the Dodge-Romig sampling plans. Numerical problems

07 Hours

UNIT - 8

Cumulative-Sum (Cusum) & Exponentially Weighted Moving Average (Ewma) Control Charts: CUSUM Control Chart (basic principles of the chart for monitoring the process mean); EWMA control chart (EWMA control chart for monitoring process mean), design of an EWMA control chart.

06 Hours

TEXT BOOKS:

1. **Statistical Quality Control,** E.L. Grant and R.S. Leavenworth, 7th edition, McGraw- Hill publisher.
2. **Statistical Quality Control,** RC Gupta, Khanna Publishers, New Delhi, 2005

REFERENCE BOOKS:

1. **Statistical Process Control and Quality Improvement,** Gerald M. Smith, Pearson Prentice Hall. ISBN 0 – 13-049036-9.
2. **Statistical Quality Control for Manufacturing Managers,** W S Messina, Wiley & Sons, Inc. New York, 1987
3. **Statistical Quality Control,** Montgomery, Douglas, 5th Edition, John Wiley & Sons, Inc. 2005, Hoboken, NJ (ISBN 0-471-65631-3).
4. **Principles of Quality Control,** Jerry Banks, Wiley & Sons, Inc. New York.

VII SEMESTER

ENGINEERING ECONOMY

Subject Code	**: 10ME71**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Engineering Decision-Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy. Engineering Economic Decision, Maze. Law of demand and supply, Law of returns, Interest and Interest factors: Interest rate, Simple interest, Compound interest, Cash - flow diagrams, Personal loans and EMI Payment, Exercises and Discussion.

08 Hours

UNIT - 2

Present-Worth Comparisons: Conditions for present worth comparisons, Basic Present worth comparisons, Present-worth equivalence, Net Present-worth, Assets with unequal lives, infinite lives, Future-worth comparison, Pay-back comparison, Exercises, Discussions and problems.

06 Hours

UNIT - 3

Equivalent Annual-Worth Comparisons: Equivalent Annual-Worth Comparison methods, Situations for Equivalent Annual-Worth Comparisons, Consideration of asset life, Comparison of assets with equal and unequal lives, Use of shrinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

06 Hours

UNIT - 4

Rate-Of-Return Calculations And Depreciation: Rate of return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts.

Causes of Depreciation, Basic methods of computing depreciation charges, Tax concepts, corporate income tax.

06 Hours

PART – B

UNIT - 5

Estimating and Costing: Components of costs such as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads, First cost, Marginal cost, Selling price, Estimation for simple components.

05 Hours

UNIT - 6

Introduction, Scope Of Finance, Finance Functions: Statements of Financial Information: Introduction, Source of financial information, Financial statements, Balance sheet, Profit and Loss account, relation between Balance sheet and Profit and Loss account. Simple Numericals

08 Hours

UNIT - 7

Financial Ratio Analysis: Introduction, Nature of ratio analysis, Liquidity ratios, Leverage ratios, Activity ratios, Profitability ratios, Evaluation of a firm's earning power. Comparative statements analysis. Simple numericals

06 Hours

UNIT - 8

Financial And Profit Planning: Introduction, Financial planning, Profit planning, Objectives of profit planning, Essentials of profit planning, Budget administration, type of budgets, preparation of budgets, advantages, problems and dangers of budgeting. Introduction to Bench Marking of Manufacturing Operation.

07 Hours

TEXT BOOKS:

1. **Engineering Economy,** Riggs J.L., 4^{TH} ed. , McGraw Hill, 2002
2. **Engineering Economy,** Thuesen H.G. PHI , 2002

REFERENCE BOOKS:

1. **Engineering Economy,** Tarachand, 2000.
2. **Industrial Engineering and Management**, OP Khanna, Dhanpat Rai & Sons. 2000
3. **Financial Mangement,** Prasanna Chandra, 7th Ed., TMH, 2004
4. **Finacial Management,** IM PANDEY, Vikas Pub. House, 2002

MECHANICAL VIBRATIONS

Subject Code	**: 10ME72**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT - 1

Introduction: Types of vibrations, Definitions, Simple Harmonic Motion (S.H.M.), Work done by harmonic force, Principle of super position applied to SHM, Beats, Fourier theorem and problems.

06 Hours

UNIT -2

Undamped (Single Degree of Freedom) Free Vibrations: Derivations for spring mass systems, Methods of Analysis, Natural frequencies of simple systems, Springs in series and parallel, Torsional and transverse vibrations, Effect of mass of spring and Problems.

07 Hours

UNIT - 3

Damped free vibrations (1DOF): Types of damping**,** Analysis with viscous damping - Derivations for over, critical and under damped systems, Logarithmic decrement and Problems.

06 Hours

UNIT - 4

Forced Vibrations (1DOF): Introduction**,** Analysis of forced vibration with constant harmonic excitation - magnification factor, rotating and reciprocating unbalances, excitation of support (relative and absolute amplitudes), force and motion transmissibility, Energy dissipated due to damping and Problems.

07 Hours

PART – B

UNIT – 5

Vibration Measuring Instruments and Whirling of shafts: Seismic Instruments – Vibrometers, Accelerometer, Frequency measuring instruments and Problems. Whirling of shafts with and without damping, discussion of speeds above and below critical speeds and Problems.

06 Hours

UNIT – 6

Systems with two degrees of Freedom: Principle modes of vibrations, Normal mode and natural frequencies of systems (without damping) – Simple spring mass systems, masses on tightly stretched strings, double pendulum, torsional systems, combined rectilinear and angular systems, geared systems and Problems. Undamped dynamic vibration absorber and Problems.

06 Hours

UNIT - 7

Numerical Methods for multi degree freedom of systems: Introduction, Maxwell's reciprocal theorem, Influence coefficients, Rayleigh's method, Dunkerley's method, Stodola method, Holzer's method, Orthogonality of principal modes, method of matrix iteration and Problems.

09 Hours

UNIT – 8

Modal analysis and Condition Monitoring: Signal analysis, dynamic testing of machines and structures, Experimental modal analysis, Machine condition monitoring and diagnosis**.**

05 Hours

TEXT BOOKS:

1. **Mechanical Vibrations,** S. S. Rao, Pearson Education Inc, 4th edition, 2003.
2. **Mechanical Vibrations,** V. P. Singh, Dhanpat Rai & Company, 3rd edition, 2006.

REFERENCE BOOKS:

1. **Theory of Vibration with Applications,** W. T. Thomson, M. D. Dahleh and C. Padmanabhan, Pearson Education Inc, 5^{th} edition, 2008.
2. **Mechanical Vibrations:** S. Graham Kelly, Schaum's outline Series, Tata McGraw Hill, Special Indian Edition, 2007.
3. **Theory and Practice of Mechanical Vibrations:** J. S. Rao & K. Gupta, New Age International Publications, New Delhi, 2001.
4. **Mechanical Vibrations,** G. K.Grover, Nem Chand and Bros, 6^{th} edition, 1996.

HYDRAULICS AND PNEUMATICS

Subject Code	**: 10ME73**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT -1

Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.

The source of Hydraulic Power: Pumps Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps.

07 Hours

UNIT -2

Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements, cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic Motor

Performance, problems, symbolic representation of hydraulic actuators (cylinders and motors).

06 Hours

UNIT - 3

Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves - compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

07 Hours

UNIT - 4

Hydraulic Circuit Design And Analysis: Control of Single and Double - Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application, Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits.

06 Hours

PART – B

UNIT - 5

Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting.

06 Hours

UNIT - 6

Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit.

Pneumatic Actuators: Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements-Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols.

07 Hours

UNIT-7

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.

Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications, Time dependent controls principle. Construction, practical applications.

07 Hours

UNIT-8

Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control: Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.

Compressed Air: Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout.

06 Hours

TEXT BOOKS:

1. **"Fluid Power with Applications",** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995
5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

OPERATION RESEARCH

Subject Code	**: 10ME74**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT -1

Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method.

04 Hours

UNIT -2

Solution Of Linear Programming Problems: The simplex method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method.

08 Hours

UNIT -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

08 Hours

UNIT -4

Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-One programming.

06 Hours

PART- B

UNIT -5

Pert-CPM Techniques: Introduction, network construction - rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects.

08 Hours

UNIT -6

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis.

06 Hours

UNIT -7

Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

06 Hours

UNIT -8

Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing 2 jobs on 'm' machines using graphical method.

06 Hours

TEXT BOOKS:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi - 2007
2. **Operations Research,** Taha H A, Pearson Education

REFERNCE BOOKS:

1. **Operations Research,** A P Verma, S K Kataria &Sons, 2008
2. **Operations Research,** Paneerselvan, PHI
3. **Operations Research,** A M Natarajan, P Balasubramani, Pearson Education, 2005
4. **Introduction to Operations Research,** Hillier and Liberman,8^{th} Ed., McGraw Hill
5. **Operations Research** S.D. Sharma, Ledarnath Ramanath & Co, 2002

DESIGN LABORATORY

Subject Code	**: 10MEL77**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART – A

1. Determination of natural frequency, logarithmic decrement, damping ratio and damping coefficient in a single degree of freedom vibrating systems (longitudinal and torsional)
2. Balancing of rotating masses.
3. Determination of critical speed of a rotating shaft.
4. Determination of Fringe constant of Photoelastic material using.

a) Circular disc subjected to diametral compression.
b) Pure bending specimen (four point bending)

5. Determination of stress concentration using Photoelasticity for simple components like plate with a hole under tension or bending, circular disk with circular hole under compression, 2D Crane hook.

PART - B

6. Determination of equilibrium speed, sensitiveness, power and effort of Porter/Prowel /Hartnel Governor. (only one or more)
7. Determination of Pressure distribution in Journal bearing.
8. Determination of Principal Stresses and strains in a member subjected to combined loading using Strain rosettes.
9. Determination of stresses in Curved beam using strain gauge.
10. Experiments on Gyroscope (Demonstration only)

Scheme of Examination:

One question from Part A	-	20 Marks (05 Write up +15)
One question from Part B	-	20 Marks (05 Write up +15)
Viva - Voce	-	10 Marks

Total:		**50 Marks**

CIM & AUTOMATION LAB

Subject Code	**: 10MEL78**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 42**	**Exam Marks**	**: 50**

PART – A

CNC part programming using CAM packages. Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like Master- CAM, or any equivalent software.

PART – B

(Only for Demo/Viva voce)

1. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.
2. Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects, 2 programs.

PART – C

(Only for Demo/Viva voce)

Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

Scheme of Examination:

Two questions from Part A	- 40 Marks (20 Write up +20)
Viva - Voce	- 10 Marks

Total:	**50 Marks**

ELECTIVE-II (GROUP B)

MECHANISM DESIGN

Subject Code	**: 10ME751**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT-1

Planar Mechanisms and Geometry of Motion: Definitions and basic concepts, Classification of links, Classification of pairs, Mechanism and machine, Inversions, Grashoff's law, Transmission of torque and force in mechanisms, Mobility, Degree of freedom permitted by joints other than turning and sliding, Equivalent mechanisms, Unique mechanisms.

07 Hours

UNIT-2

Number Synthesis: Effect of even or odd number of links on degree of freedom, Minimum number of binary links in a mechanism, Minimum possible number of turning pairs, Enumeration of kinematic chain, Degree of freedom of special mechanisms.

06 Hours

UNIT-3

Synthesis of Linkages: Type, Number and dimensional synthesis, Function generation, Path generation and body guidance, Precision positions, Structural error, Chebychev spacing, Two position synthesis of slider crank mechanisms, Crank-rocker mechanisms with optimum transmission angle.

07 Hours

UNIT-4

Motion Generation: Poles and relative poles, Relative poles of 4-bar mechanism, Relative poles of slider crank mechanism.

06 Hours

PART – B

UNIT-5

Graphical Methods of Dimensional Synthesis: Two position synthesis of crank and rocker mechanisms, Three position synthesis, Four position synthesis (point position reduction), Overlay method.

06 Hours

UNIT-6

Coupler Curves: Equation of coupler curves, Synthesis for path generation, Graphical synthesis for path generation, Robert-Chebyshev theorem (cognate linkages), Coupler curves from 5-bar mechanisms, Examples.

07 Hours

UNIT-7

Analytical Methods of Dimensional Synthesis: Freudenstein's equation for 4-bar mechanism and slider crank mechanism, Examples, Bloch's method of synthesis.

06 Hours

UNIT-8

Cams: Introduction, Pressure angle, Parameters affecting pressure angle, Effect of offset follower motion, Radius of curvature and undercutting, Cams with specified contours.

07 Hours

TEXT BOOKS:

1. **"Theory of Machines & Mechanisms",** J.J. Uicker, , G.R. Pennock, J.E. Shigley. OXFORD 3rd Ed.
2. **'Mechanism & Machine Theory'**, A.G. Ambekar, PHI, 2007

REFERENCE BOOKS:

1. **'Kinematics, Dynamics & Design of Machinery'**, K. J. Waldron, G. L. Kinzel, Wiley India, 2007.
2. **'Advanced Mechanism Design'**, Erdman Sandoor, Vol-l PHI, 2006,
3. **"Kinematics & Dynamics of Machinery**" H.H. Mabie, F.W. Ocvirk, John Wiley & Sons, New York, 3rd Ed.

THEORY OF PLASTICITY

Subject Code	**: 10ME752**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Fundamental Of Elasticity: Concept of stress, stress transformation laws, spherical and deviator stress tensors, equilibrium equations, octahedral stresses, concept of strain, deviator and spherical strain tensors, strain transformation laws, octahedral strains, generalized Hooke's law, elastic strain energy, compatibility equations, theories of strength. problems.

07 Hours

UNIT - 2

Plastic Deformation Of Metals: Crystalline structure in metals, mechanism of plastic deformation, factors affecting plastic deformation, strain hardening, recovery, recrystallization and grain growth, flow figures or luder's cubes.

06 Hours

UNIT - 3

Cubical Dilation, True Stress And Strain: Strain tensor, principal strain, plane strain, spherical and deviator strain, octahedral strain and representative strain, problems.

07 Hours

UNIT - 4

Stress Strain Relations: Introduction, types of materials, empirical equations, theories of plastic flow, experimental verification of St.Venant's theory of plastic flow, the concept of plastic potential, the maximum work hypothesis, mechanical work for deforming a plastic substance.

06 Hours

PART – B

UNIT - 5

Yield Criteria: Introduction, yield or plasticity conditions, Von Mises and Tresca criteria, Geometrical representation, yield surface, yield locus (two dimensional stress space), experimental evidence for yield criteria, energy required to change the shape with basic principle problems

07 Hours

UNIT - 6

Slip Line Field Theory: Introduction, basic equations for incompressible two dimensional flow, continuity equations, stresses in conditions of plain strain, convention for slip lines, solutions of plastic deformation problem, Geometry of slip line field, Properties of the slip lines, construction of slip line nets

07 Hours

UNIT - 7

Bending Of Beams: Analysis for stresses, Non linear stress strain curve, shear stress distribution, residual stresses in plastic bending, problems.

06 Hours

UNIT - 8

Torsion Of Bars: Introduction, plastic torsion of a circular bar, elastic perfectly plastic material, elastic work hardening of material, residual stresses and problems

06 Hours

TEXT BOOKS:

1. '**Theory of Plasticity',** Chakraborty 3rd Edition Elsevier.
2. **'Engineering Plasticity',** W. Johnson and P. B. Mellor D Van N.O Strand Co. Ltd 2000

REFERENCE BOOKS:

1. **Basic Engineering Plasticity,** DWA Rees 1st Edition Elsevier.
2. **Theory of Plasticity,** L. S. Srinath TMH,
3. **Theory of Plasticity,** Sadhu Singh, Kanna publisher

ENGINEERING DESIGN

Subject Code	**: 10ME753**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT-1

Identifying Customer Needs, Gather raw data from customers, Interpret raw data in terms of customer needs, Organize the needs into a hierarchy, Establish the relative importance of the needs, Reflect on the results and the process.

06 Hours

UNIT -2

The Design Process: Introduction, The design process, The design process steps, A detailed morphology of design, Further considerations in design, Spectrum of engineering activities, Organization of the engineering function, The product life cycle, Technological forecasting and innovation, Market identification, Competitive benchmarking ,Human factors in design

07 Hours

UNIT-3

Design Methods: Introduction, Creativity and problem solving, Creativity methods, The problem statement, Product design specifications, Concept selection technique, Methods of conceptual design, Design principles, Decision theory, Evaluating alternatives, Decision trees.

07 Hours

UNIT-4

Modeling and Simulation: Role of models in design, Mathematical modeling, Similitude and scale models, Simulation, Geometric modeling.

06 Hours

PART – B

UNIT-5

Human Engineering Consideration: Introduction, Human being as applicator of forces, Anthropometry, The design of controls, Design of displays, Man/Machine information exchange.

07 Hours

UNIT-6

Risk and Reliability: Probabilistic approach to design, Reliability theory, Design for reliability, Hazard analysis, Bath tub curve, Mean life, MTTF and MTBF, Exponential and Weibull distribution, series and parallel configuration, Combination of series and parallel configuration Fault tree analysis.

07 Hours

UNIT-7

Material Selection: Performance characteristics of materials, Material selection process, Sources of information on materials, Economics of materials, Methods of material selection, cost verses performance relations, weighted property index, Value analysis.

06 Hours

UNIT-8

Robust Design: What is robust design, Identify control factors, Noise factors, Formulate an objective function, Develop the experimental plan, Run the experimental plan, Conduct the analysis, Select and confirm factor set points, Reflect and repeat.

06 Hours

TEXT BOOKS:

1. **Engineering Design** *: A Materials and Processing Approach*, George E. Dieter, 4th Ed., Mc. Graw Hill Company, Newyork
2. **Product Design and Development**. T. Ulrich. and S. D. Eppinger, Tata Mc Graw Hill -2003

REFERENCE BOOKS:

1. **The Mechanical Design Process**, D,. G. Ullman. 4th Ed., International Edition, 1992.
2. **Product Design and Manufacturing**, A. K. Chitale, R. C. Gupta, PHI, 2nd Ed – 2002.

NON-CONVENTIONAL ENERGY SOURCES

Subject Code	**: 10ME754**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART A

UNIT – 1

Introduction : Energy source, India's production and reserves of commercial energy sources, need for non-conventional energy sources, energy alternatives, solar, thermal, photovoltaic. Water power, wind bio-mass, ocean temperature difference, tidal and waves, geothermal, tarsands and oil shale, nuclear (Brief descriptions); advantages and disadvantages, comparison (Qualitative and Quantitative).

6 Hours

UNIT – 2

Solar Radiation : Extra-Terrestrial radiation, spectral distribution of extra terrestrial radiation, solar constant, solar radiation at the earth's surface, beam, diffuse and global radiation, solar radiation data.

Measurement of Solar Radiation : Pyrometer, shading ring pyrheliometer, sunshine recorder, schematic diagrams and principle of working.

Solar Radiation Geometry : Flux on a plane surface, latitude, declination angle, surface azimuth angle, hour angle, zenith angle, solar altitude angle expression for the angle between the incident beam and the normal to a plane surface (No derivation) local apparent time. Apparent motion of sum, day length, numerical examples.

9 Hours

UNIT – 3

Radiation Flux on a Tilted Surface : Beam, diffuse and reflected radiation, expression for flux on a tilted surface (no derivations) numerical examples.

Solar Thermal Conversion : Collection and storage, thermal collection devices, liquid flat plate collectors, solar air heaters concentrating collectors (cylindrical, parabolic, paraboloid) (Quantitative analysis); sensible heat storage, latent heat storage, application of solar energy water heating. Space heating and cooling, active and passive systems, power generation, refrigeration. Distillation (Qualitative analysis) solar pond, principle of working, operational problems.

9 Hours

UNIT – 4

Performance Analysis of Liquid Flat Plate Collectors : General description, collector geometry, selective surface (qualitative discussion) basic energy-balance equation, stagnation temperature, transmissivity of the cover system, transmissivity – absorptivity product, numerical examples. The overall loss coefficient, correlation for the top loss coefficient, bottom and side loss coefficient, problems (all correlations to be provided). Temperature distribution between the collector tubes, collector heat removal factor, collector efficiency factor and collector flow factor, mean plate temperature, instantaneous efficiency (all expressions to be provided). Effect of various parameters on the collector performance; collector orientation, selective surface, fluid inlet temperature, number covers, dust.

4 Hours

PART B

UNIT – 5

Photovoltaic Conversion : Description, principle of working and characteristics, applications.

Wind Energy : Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, wind machines; 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 of wind mill design, numerical examples.

8 Hours

UNIT – 6

Tidal Power : Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, limitations.

Ocean Thermal Energy Conversion : Principle of working, Rankine cycle, OTEC power stations in the world, problems associated with OTEC.

Geothermal Energy Conversion : Principle of working, types of geothermal station with schematic diagram, geothermal plants in the world, problems associated with geothermal conversion, scope of geothermal energy.

7 Hours

UNIT – 7

Energy from Bio Mass : Photosynthesis, photosynthetic oxygen production, energy plantation, bio gas production from organic wastes by anaerobic fermentation, description of bio-gas plants, transportation of bio-gas, problems involved with bio-gas production, application of bio-gas, application of bio-gas in engines, advantages.

4 Hours

UNIT – 8

Hydrogen Energy : Properties of Hydrogen with respected to its utilization as a renewable form of energy, sources of hydrogen, production of hydrogen, electrolysis of water, thermal decomposition of water, thermo chemical production bio-chemical production.

Storage & Transportation Methods : Gaseous, cryogenic and metal hydrides, application of hydrogen, domestic and industrial safe burning of hydrogen.

5 Hours

TEXT BOOKS:

1. Non-Conventional Energy Sources by *G.D Rai K*, Khanna Publishers, 2003.
2. Solar energy, by *Subhas P Sukhatme* – Tata McGraw Hill, 2nd Edition, 1996.

REFERENCE BOOKS:

1. Renewable Energy Sources and Conversion Technology by *N.K.Bansal, Manfred Kleeman & Mechael Meliss*, Tata McGraw Hill, 2001.
2. Renewable Energy Resources, *John W.Twidell Anthony D. Weir El*, BG 2001.
3. Solar Power Engineering, *P.K.Nag*, Tata McGraw Hill, 2003.

GAS DYNAMICS

Subject Code	**: 10ME755**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Fundamental Equations Of Steady Flow: Continuity and momentum equations, The thrust function, The dynamic equation and Euler's Equation. Bernoulli's Equation. Steady flow energy equation.

08 Hours

UNIT - 2

Isentropic Flow: Acoustic velocity, Mach number, Mach cone and Mach angle. Flow parameters, stagnation temperature, pressure, and density.

06 Hours

UNIT - 3

Adiabatic Flow: Stagnation temperature change. Rayleigh line, Pressure ratio and temperature ratio, Entropy considerations, maximum heat transfer.

06 Hours

UNIT - 4

Flow With Friction: The fanning equation, Friction factor and friction parameter, Fanno line, Fanno equations.

06 Hours

PART – B

UNIT - 5

Wave Phenomena: Classification of wave phenomena, analysis of shock phenomena, Hugoniot equation. Weak waves, compression waves, Normal shock waves, oblique shock waves, Entropy considerations, Rayleigh Pilot equations, detonation and deflageration.

06 Hours

UNIT - 6

Variable Area Flow: Velocity variation with Isentropic flow, Criteria for acceleration and deceleration. Effect of pressure ratio on Nozzle operation. Convergent nozzle and convergent divergent nozzle. Effect of back pressure on nozzle flow. Isothermal flow functions. Comparison of flow in nozzle. Generalized one dimensional flow.

07 Hours

UNIT - 7

Applications of dimensional analysis and similitude to gas dynamic problems.

06 Hours

UNIT - 8

Introduction To Flames And Combustion: Flame propagation, diffusion flames, premixed flames, flame velocity, theories of flame propagation, ignition for combustible mixture, flame stabilization.

07 Hours

TEXT BOOKS:

1. **Fundamentals of Compressible flow**: Yahya, 2^{nd} Edn. 1991; Wieley Eastern.
2. **Gas Dynamics,** E Radhakrishnan PHI-2006

REFERENCE BOOKS:

1. **Introduction to Gas Dynamics:** Rolty, Wiley 1998
2. **Elements of Gas Dynamics:** Liepmann and Roshko, Wiley 1994.
3. **The dynamics and thermodynamics of compressible fluid flow:** Shapiro Ronold press. 1994.
4. **Compressible Fluid Flow**, J. F. Anderson

MANAGEMENT INFORMATION SYSTEM

Subject Code	**: 10ME756**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

The Information Age: An Overview: The purpose, data, information, and information systems and their types, ethical and societal issues, information systems in business functions, web empowered enterprises.

05 Hours

UNIT - 2

Strategic Uses of Information Systems: Strategies and Strategic moves, Achieving a competitive advantage, creating and maintaining strategic information systems, Business Functions and Supply Chains – effectiveness and efficiency, accounting, finance, engineering, supply chain management, Human resource management, Enterprise resource planning.

05 Hours

UNIT - 3

Information Technology: Business Hardware – components, classification of computers, output devices, storage media, and purchasing,, Business Software – programming languages and software development tools, language translation, compilers and interpreters, system software, open source software, software licensing, ethical issues,

08 Hours

UNIT - 4

Business Networks and Telecommunication: Telecommunication in Business and Daily Use, Bandwidths and Media, networks, protocols, internet networking services, Telecommuting – pros and cons, Future of Networking Technologies.

08 Hours

PART – B

UNIT - 5

Web Enabled Commerce: Web enabled enterprises – web business and technologies, web enabled business, Challenges of Global Information Systems – Multinational organizations, international commerce, ethical issues.

07 hours

UNIT - 6

Decision Support and Business intelligence: Decision support and expert systems – decision support and decision making process, structured and unstructured problems, decision support systems, expert systems, geographical systems, Business Intelligence and Knowledge Management – Data Mining and online analysis, knowledge management,

06 Hours

UNIT - 7

Planning, Acquisition, and Control: Systems Planning and Development – Planning Information systems, systems development life cycle, agile methods, systems integration, ethical issues – IS professionals certification.

07 Hours

UNIT - 8

Choices in Systems Acquisition: Options and Priorities, outsourcing, licensing applications, software as a service, user application development, ethical issues- computer use policies for employees.

06 Hours

TEXT BOOKS:

1. **Management Information Systems**, Effy Oz, Cengage Learning, INDIA EDITION, 2009.
2. **Management Information Systems**, James A O'Brien, Irwin, 9^{th} Ed., McGraw Hill.

REFERENCE BOOKS:

1. **Management Information Systems,** Laudon & Laudon, PHI 1998 Ed. ISBN 81-203-1282-1
2. **Management Information systems,** S.Sadagopan, Prentice Hall of India, 1998 Ed. ISBN 81-203-1180-9
3. **Information systems for Modern management** G.R.Murdick PHI 2002.

AUTOMATION IN MANUFACTURING

Subject Code	**: 10ME757**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Production System Facilities, Manufacturing Support systems, Automation in Production systems, Automation principles & Strategies

05 Hours

UNIT - 2

Manufacturing Operations: Manufacturing Operations, Product/Production Relationship, Production concepts and Mathematical Models & Costs of Manufacturing Operations

07 Hours

UNIT - 3

Industrial Control System: Basic Elements of an Automated System, Advanced Automation Functions & Levels of Automation, Continuous versus Discrete control, Computer Process control, Forms of Computer Process Control.

07 Hours

UNIT - 4

Automated Manufacturing Systems: Components of a Manufacturing systems, Classification of Manufacturing Systems, overview of Classification Scheme, Single Station Manned Workstations and Single Station Automated Cells.

07 Hours

PART – B

UNIT - 5

Group Technology & Flexible Manufacturing Systems: Part Families, Parts Classification and coding, Production Flow Analysis, Cellular Manufacturing, Flexible Manufacturing Systems: What is an FMS, FMS Components, FMS Applications & Benefits, and FMS Planning & Implementation Issues.

08 Hours

UNIT - 6

Quality Control Systems: Traditional and Modern Quality Control Methods, Taguchi Methods in Quality Engineering. Introduction to SQC Tools.

04 Hours

UNIT - 7

Inspection Technologies: Automated Inspection, Coordinate Measuring Machines Construction, operation & Programming, Software, Application & Benefits, Flexible Inspection System, Inspection Probes on Machine Tools, Machine Vision, Optical Inspection Techniques & Non-contact Non-optical Inspection Technologies

06 Hours

UNIT - 8

Manufacturing Support System: Process Planning, Computer Aided Process Planning, Concurrent Engineering & Design for Manufacturing, Advanced Manufacturing Planning, Just-in Time Production System, Basic concepts of lean and Agile manufacturing.

08 Hours

TEXT BOOKS:

1. **Automation, Production Systems and Computer Integrated Manufacturing,** M. P. Groover, Pearson education. Third Edition, 2008
2. **Principles of CIM,** Vajpayee, PHI.

REFERENCE BOOKS:

1. **Anatomy of Automation**, Amber G.H & P. S. Amber, Prentice Hall.
2. **Performance Modeling of Automated Manufacturing Systems,** Viswanandham, PHI
3. **Computer Based Industrial Control**, Krishna Kant, EEE-PHI

TOTAL QUALITY MANAGEMENT

Subject Code	**: 10ME758**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Principles and Practice: Definition, basic approach, gurus of TQM, TQM Framework, awareness, defining quality, historical review, obstacles, benefits of TQM.

06 Hours

UNIT - 2

Leadership: Definition, characteristics of quality leaders, leadership concept, characteristics of effective people, ethics, the Deming philosophy, role of TQM leaders, implementation, core values, concepts and framework, strategic planning communication, decision making,

06 Hours

UNIT - 3

Customer Satisfaction and Customer Involvement:

Customer Satisfaction **:** customer and customer perception of quality, feedback, using customer complaints, service quality, translating needs into requirements, customer retention, Case studies.

Employee Involvement – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, performance appraisal, unions and employee involvement, case studies.

07 Hours

UNIT - 4

Continuous Process Improvement: process, the Juran trilogy, improvement strategies, types of problems, the PDSA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies.

Tools and Techniques: Benching marking, information technology, quality management systems, environmental management system, quality function deployment, quality by design, failure mode and effect analysis, product liability, total productive maintenance.

07 Hours

PART – B

UNIT - 5

Quality Management Tools : Why Why, forced filed analysis, nominal group technique, affinity diagram, interrelationship digraph, tree diagram, matrix diagram, prioritization matrices, process decision program chart, activity network diagram.

07 hours

UNIT - 6

Statistical Process Control : Pareto diagram, process flow diagram, cause-and-effect diagram, check sheets, histograms, statistical fundamentals, Control charts, state of control, out of control process, control charts for variables, control charts for attributes, scatter diagrams, case studies.

06 Hours

UNIT - 7

Building and Sustaining Performance Excellence in Organizations : Making the commitment to total quality, organizational culture and total quality, change management, sustaining the quality organization, self-assessment processes, implementing ISO 9000, Bald ridge, and six sigma, a view toward the future.

07 Hours

UNIT - 8

Design for Six Sigma: Tools for concept development, tools for design development, tools for design optimization, tools for design verification, problems.

06 Hours

TEXT BOOKS:

1. **Total Quality Management:** Dale H. Bester field, Publisher - Pearson Education India, ISBN: 8129702606, Edition 03/e Paperback (Special Indian Edition)
2. **Total Quality Management for Engineers:** M. Zairi, ISBN: 1855730243, Publisher: Wood head Publishing

REFERENCE BOOKS:

1. **A New American TQM, four revolutions in management,** Shoji Shiba, Alan Graham, David Walden, Productivity press, Oregon, 1990
2. **100 Methods for Total Quality Management**: Gopal K. Kanji and Mike Asher, ISBN: 0803977476, Publisher: Sage Publications, Inc.; Edition – 1
3. **Organisational Excellence through TQM, H**. Lal, New age pub, 2008

ELECTIVE-III (GROUP C)

EXPERIMENTAL STRESS ANALYSIS

Subject Code	**: 10ME761**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT-1

Electrical Resistance Strain Gages: Strain sensitivity in metallic alloys, Gage construction, Adhesives and mounting techniques, Gage sensitivity and gage factor, Performance Characteristics, Environmental effects, Strain Gage circuits. Potentiometer, Wheatstone's bridges, Constant current circuits.

06 Hours

UNIT-2

Strain Analysis Methods: Two element, three element rectangular and delta rosettes, Correction for transverse strain effects, Stress gage, Plane shear gage, Stress intensity factor gage.

06 Hours

UNIT-3

Photo-elasticity: Nature of light, Wave theory of light - optical interference , Stress optic law – effect of stressed model in plane and circular polariscopes, Isoclinics & Isochromatics, Fringe order determination Fringe multiplication techniques, Calibration photoelastic model materials

08 Hours

UNIT-4

Two Dimensional Photo-elasticity: Separation methods: Shear difference method, Analytical separation methods, Model to prototype scaling, Properties of 2D photo-elastic model materials, Materials for 2D photo-elasticity

06 Hours

PART –B

UNIT-5

Three Dimensional Photo elasticity: Stress freezing method, Scattered light photo-elasticity, Scattered light as an interior analyzer and polarizer, Scattered light polariscope and stress data Analyses.

06 Hours

UNIT-6

Photoelastic (Birefringent) Coatings : Birefringence coating stresses, Effects of coating thickness: Reinforcing effects, Poisson's, Stress separation techniques: Oblique incidence, Strip coatings.

08 Hours

UNIT-7

Brittle Coatings: Coatings stresses, Crack patterns, Refrigeration techniques, Load relaxation techniques, Crack detection methods, Types of brittle coatings, Calibration of coating. Advantages and brittle coating applications.

06 Hours

UNIT-8

Moire Methods: Moire fringes produced by mechanical interference .Geometrical approach, Displacement field approach to Moire fringe analysis ,0ut of plane displacement measurements, Out of plane slope measurements .Applications and advantages

06 Hours

TEXT BOOKS:

1. **"Experimental Stress Analysis",** Dally and Riley, McGraw Hill.
2. **"Experimental Stress Analysis".** Sadhu Singh, Khanna publisher.
3. **Experimental stress Analysis**, Srinath L.S tata McGraw Hill.

REFERENCES BOOKS :

1. **"Photoelasticity Vol I and Vol II,** M.M.Frocht, John Wiley & sons.
2. **"Strain Gauge Primer",** Perry and Lissner,
3. **"Photo Elastic Stress Analysis",** Kuske, Albrecht & Robertson John Wiley & Sons.
4. **"Motion Measurement and Stress Analysis",** Dave and Adams,

TOOL DESIGN

Subject Code	**: 10ME762**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction to tool design: Tooling, requirements of a tool designer, general tool design procedure.

Design of Single point Cutting Tools: Design of single point lathe tool: Design of shank dimension using strength and rigidity considerations for rectangular, square and round cross section and selection of tool geometry. Solid type tool, brazed tip tool, long index able insert, throwaway index able insert types and chip breakers.

06 Hours

UNIT - 2

Design of Multi Point Cutting Tool: Drill bit design of elements like back taper, web thickness, land width, margin, flute length and cross section and selection of tool geometry. Design of milling cutter: Design of elements like number of teeth and height circular pitch, body thickness, chamfer width, fillet radius and selection of tool geometry.

04 Hours

UNIT - 3

Design of Jigs : Functions and differences between jigs and fixtures, advantages in mass production, design principles, economics of jigs and fixtures. Principles of location -3-2-1 and 4-1-1 types of locations, different types of locating elements. Clamping – Principles of clamping, types of clamping including power clamping devices. Drill jigs- Types, Drill bushes, simple exercises of designing jigs for given components.

05 Hours

UNIT - 4

Design of Fixtures: Fixture Design Turning fixtures, milling fixtures, grinding and broaching fixtures, indexing fixtures. Design of fixtures for simple components.

05 Hours

PART – B

UNIT - 5

Design of Sheet Metal: Working of a power press and classification of presses. Components of a simple die, press tool operation, die accessories, shearing action in punch & die, clearance, shear on punch and die, Centre of pressure and problems, scrap strip layout. Simple, progressive, compound, combination and inverted dies. Design problems on blanking and piercing dies for simple components.

05 Hours

UNIT - 6

Bending & Drawing: Bending dies – Introduction, bend allowance, spring back, edge bending die design. Drawing dies – Single action, double action and triple action dies, factors affecting drawing, drawing die design.

05 Hours

UNIT - 7

Die Casting Dies : Terminology: Core, cavity, sprue, slug, fixed and movable cores, finger cams, draft, ejector pins ejector plates, gate, goose-nozzle, over-flow, platten, plunger, runner, vent, water-line etc. Types of Dies: Single cavity, multicavity dies, combination dies, unit dies, advantages and disadvantages of types of dies. Die casting dies, unit dies. advantages and disadvantages of types of dies. Die casting alloys, defects in die casting, finishing trimming and inspection of die casting components, safety, modern trends in die casting dies.

05 Hours

UNIT - 8

Injection Molding: Injection moulding machine and its elements, general configuration of a mould. 2 plate and 3 plate mould. Introduction, to gate, runner, parting surface, ejection system. Core and cooling system.

Introduction to compression, transfer, blow moulding, extrusion, forming and calendaring.

05 Hours

TEXT BOOKS:

1. **Tool Design**, C. Donaldson, G.H.Le Cain V.C. Goold, Tata McGraw Hill pub.1976.
2. **Metal cutting theory & cutting tool design**, V. Arshinow and G. Alfseev Mir pub. Mascow Edu 1976:

REFERENCE BOOKS:

1. **Introduction to jigs and fixture design**, M H A Kempster, Elbs, Edn. 1974.
2. **Tool engineering and design**, Nagpal Khanna pub.Edn. 1998.
3. **Fundamentals of tool design**, ASTME Prentice Hall India.2000
4. **Metal cutting and tool design**, DR,B,J, Ranga, Vikas Pub. Edn. 1993.
5. **Manufacturing technology (foundry forming and welding)** P.N. Rao, Tata McGraw Hill Pub, Edn.1996
6. **Die Casting Die Design**, Burton 2000
7. **Injection Moulding Design**, RGW Pye, john.1998
8. **Injection Moulding Handbook**, Dominick V. Rosato & Donald V. Rosato, 1996, CBS Publishers

Scheme of Examination:

1. Eight questions to be set selecting FOUR questions from each Part
2. Each question carries 20 marks.
3. Five questions to be solved selecting at least two question from each Part

CRYOGENICS

Subject Code	**: 10ME763**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Cryogenic Systems: Applications Areas of Cryogenic Engineering

Low temperature properties of engineering materials – Mechanical properties, Thermal properties, Electrical properties.
Introduction The Thermodynamically Ideal system Production of low temperatures – Joule Thompson Effect, Adiabatic expansion.

06 Hours

UNIT - 2

Gas Liquification Systems: Liquification systems for Air Simple Linde – Hampson System, Claude System, Heylndt System, Dual pressure, Claude.
Liquefaction cycle Kapitza System. Comparison of Liquefaction Cycles Liquefaction cycle for hydrogen, helium and Neon, Critical components of liquefaction systems.

07 Hours

UNIT - 3

Gas Cycle Cryogenic Refrigeration Systems: Classification of Cryo coolers Stirling cycle Cryo – refrigerators, Ideal cycle – working principle. Schmidt's analysis of Stirling cycle Various configurations of Stirling cycle refrigerators Integral piston Stirling cryo-cooler, Free displacer split type Stirling Cryo coolers, Gifford Mcmahon Cryo- refrigerator, Pulse tube refrigerator, Solvay cycle refrigerator, Vuillimier refrigerator, Cryogenic regenerators.

06 Hours

UNIT - 4

Gas Separation And Gas Purification Systems: Thermodynamic ideal separation system, Properties of mixtures, Principles of gas separation, Linde single column air separation. Linde double column air separation, Argon and Neon separation systems. Adsorption Process, PSA systems.

07 Hours

PART – B

UNIT - 5

Ultra Low Temperature Cryo – Refrigerators: Magneto Caloric Refrigerator ^3He-^4He Dilution refrigerator. Pomeranchuk cooling.

Measurement systems for low temperatures, Temperature measurement at low temperatures, Resistance thermometers, Thermocouples, Thermistors, Gas Thermometry. Liquid level sensors.

06 Hours

UNIT - 6

Vacuum Technology: Fundamental principles. Production of high vacuum, Mechanical vacuum pumps, Diffusion pumps, Cryo-pumping, Measurement of high vacuum level.

Cryogenic Insulation: Heat transfer due to conduction, Evacuated porous insulation Powder & Fibers Opacified powder insulation, Gas filled powders & Fibrous materials Multilayer super-insulation, Composite insulation.

07 Hours

UNIT - 7

Cryogenic Fluid Storage And Transfer Systems: Design of cryogenic fluid storage vessels, Inner vessel, Outer Insulation, Suspension system, Fill and drain lines. Cryogenic fluid transfer, External pressurization, Self pressurization, Transfer pump.

07 Hours

UNIT - 8

Application Of Cryogenic Systems: Cryogenic application for food preservation – Instant Quick Freezing techniques 11.2 Super conductive devices, Cryogenic applications for space technology.

06 Hours

TEXT BOOKS:

1. **Cryogenic Systems,** Randall Barron – Oxford Press, 1985
2. **Cryogenic Engineering,** Thomas M. Flynn, Marcel Dekker, Inc N.Y. Basal 1997

REFERENCE BOOK:

1. **Cryogenic Process Engineering,** Klaus D. Timmerhaus & Thomas M. Flynn, Plenum Press, New York & London 1989.

SMART MATERIALS

Subject Code	**: 10ME764**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Introduction: Characteristics of composites and ceramics materials, Dynamics and controls, concepts, Electro-magnetic materials and shape memory alloys-processing and characteristics

06 Hours

UNIT - 2

Sensing And Actuation: Principles of electromagnetic, acoustics, chemical and mechanical sensing and actuation, Types of sensors and their applications, their compatibility writer conventional and advanced materials, signal processing, principles and characterization.

07 Hours

UNIT - 3

Control Design: Design of shape memory alloys, Types of MR fluids, Characteristics and application, principles of MR fluid value designs, Magnetic circuit design, MR Dampers, Design issues.

06 Hours

UNIT - 4

Optics And Electromagnetic: Principles of optical fiber technology, characteristics of active and adaptive optical system and components, design and manufacturing principles.

07 Hours

PART – B

UNIT - 5

Structures: Principles of drag and turbulence control through smart skins, applications in environment such as aerospace and transportation vehicles, manufacturing, repair and maintainability aspects.

07 Hours

UNIT - 6

Controls: Principles of structural acoustic control, distributed, analog and digital feed back controls, Dimensional implications for structural control.

06 Hours

UNIT - 7

Principles Of Vibration And Modal Analysis: PZT Actuators, MEMS, Magnetic shape Memory Alloys, Characteristics and Applications.

07 Hours

UNIT - 8

Information Processing: Neural Network, Data Processing, Data Visualisation and Reliability – Principles and Application domains.

06 Hours

TEXT BOOKS:

1. **Analysis and Design',** A. V. Srinivasan, 'Smart Structures – Cambridge Universities Press, New York, 2001, (ISBN : 0521650267)
2. **'Smart Materials and Structures',** M V Gandhi and B S Thompson Chapmen & Hall, London, 1992 (ISBN : 0412370107)

REFERENCE BOOKS:

1. **'Smart Materials and Structures',** Banks HT, RC Smith, Y Wang, Massow S A, Paris 1996
2. **G P Gibss'Adaptive Structres',** Clark R L, W R Saunolers, Jhon Wiles and Sons, New York, 1998
3. **An introduction for scientists and Engineers',** Esic Udd, Optic Sensors : Jhon Wiley & Sons, New York, 1991 (ISBN : 0471830070)

AGILE MANUFACTURING

Subject Code	**: 10ME765**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Agile Manufacturing: Definition, business need, conceptual frame work, characteristics, generic features.

06 Hours

UNIT - 2

Developing Agile Manufacturing: Enterprise, Strategies, integration of organization, workforce and technology, reference models, examples.

07 Hours

UNIT - 3

Integration Of Product /Process Development: Principles, Robust design approach, Approaches to enhance ability in manufacturing, Role of QFD, Managing people in Agile organization, Approaches.

06 Hours

UNIT - 4

Application Of It/Is Concepts In Agile Manufacturing: Strategies, Management of complexities and information. flow, approaches, applications of multimedia to improve agility in manufacturing, system concepts.

07 Hours

PART – B

UNIT - 5

Agile Supply Chain Management: Principles, IT/IS concepts in supply chain management, enterprise integration and management in agile manufacturing, concepts, Agility, Adaptability and learners – comparison of concepts.

07 Hours

UNIT - 6

Computer Control Of Agile Manufacturing: CAPP for Agile Manufacturing, Aggregate capacity planning and production line design / redesign in Agile manufacturing, Cellular manufacturing, concepts, examples.

07 Hours

UNIT - 7

Corporate Knowledge Management In Agile Manufacturing: Strategies, strategic options in Agile manufacturing, Role of standards.

06 Hours

UNIT - 8

Design Of Skill & Knowledge: Enhancing technology for Machine tool system, Resumption of design requirement geometry, definition, methods, decision support for selection of cutting parameters, design enhancements, parametric approach only.

06 Hours

TEXT BOOKS:

1. **'Agile Manufacturing**- Forging Mew Frontiers', **Poul T Kidd,** Amagow Co. UK, ISBN-0-201-63163-6, 1994
2. **''Agile Manufacturing",** A Gunasekharan, the 21st Century Competitive strategy, ISBN -13 978-0-08-04 3567-1, Elsevier Press, India

REFERENCE BOOKS:

1. **O Levine Transitions to Agile Manufacturing,** Joseph C Moutigomery and Lawrurence – Staying Flexible for competitive advantage, ASQC quality press, Milwaukee. Wisconsiw, USA 1996
2. **Agile Development for Mass Customization,** David M Andeson and B Joseph Pine, Irwin Professional Publishing, Chicogo USa 1997

ROBOTICS

Subject Code	**: 10ME766**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction and Mathematical Representation of Robots: History of Robots, Types of Robots, Notation, Position and Orientation of a Rigid Body, Some Properties of Rotation Matrices, Successive Rotations, Euler Angles For fixed frames X- Y -Z and moving frame ZYZ. Transformation between coordinate system, Homogeneous coordinates, Properties of A/BT, Types of Joints: Rotary, Prismatic joint, Cylindrical joint, Spherical joint, Representation of Links using Denvit - Hartenberg Parameters: Link parameters for intermediate, first and last links, Link transformation matrices, Transformation matrices of 3R manipulator, PUMA560 manipulator, SCARA manipulator

07 Hours

UNIT - 2

Kinematics of Serial Manipulators: Direct kinematics of 2R, 3R, RRP, RPR manipulator, puma560 manipulator, SCARA manipulator, Stanford arm, Inverse kinematics of 2R, 3R manipulator, puma560 manipulator.

06 Hours

UNIT – 3

Velocity and Static's of Manipulators: Differential relationships, Jacobian, Differential motions of a frame (translation and rotation), Linear and angular velocity of a rigid body, Linear and angular velocities of links in serial manipulators, 2R, 3R manipulators, Jacobian of serial manipulator, Velocity ellipse of 2R manipulator, Singularities of 2R manipulators, Statics of serial manipulators, Static force and torque analysis of 3R manipulator, Singularity in force domain.

07 Hours

UNIT - 4

Dynamics of Manipulators: Kinetic energy, Potential energy, Equation of motion using Lagrangian, Equation of motions of one and two degree freedom spring mass damper systems using Lagrangian formulation, Inertia of a link, Recursive formulation of Dynamics using Newton Euler equation, Equation of motion of 2R manipulator using Lagrangian Newton-Euler formulation.

06 Hours

PART-B

UNIT - 5

Trajectory Planning: Joint space schemes, cubic trajectory, Joint space schemes with via points, Cubic trajectory with a via point, Third order polynomial trajectory planning, Linear segments with parabolic blends, Cartesian space schemes, Cartesian straight line and circular motion planning

07 Hours

UNIT - 6

Control: Feedback control of a single link manipulator- first order, second order system, PID control, PID control of multi link manipulator, Force control of manipulator, force control of single mass, Partitioning a task for force and position control- lever, peg in hole Hybrid force and position controller.

08 Hours

UNIT - 7

Actuators: Types, Characteristics of actuating system: weight, power-to-weight ratio, operating pressure, stiffness vs. compliance, Use of reduction gears, comparision of hydraulic, electric, pneumatic actuators, Hydraulic actuators, proportional feedback control, Electric motors: DC motors, Reversible AC motors, Brushles DC motors, Stepper motors- structure and principle of operation, stepper motor speed-torque characteristics

06 Hours

UNIT - 8

Sensors: Sensor characteristics, Position sensors- potentiometers, Encoders, LVDT, Resolvers, Displacement sensor, Velocity sensor-encoders, tachometers, Acceleration sensors, Force and Pressure sensors piezoelectric, force sensing resistor, Torque sensors, Touch and tactile sensor, Proximity sensors-magnetic, optical, ultrasonic, inductive, capacitive, eddy-current proximity sensors.

05 Hours

TEXT BOOKS:

1. **Fundamental Concepts and Analysis,** Ghosal A., Robotics, Oxford,2006
2. **Introduction to Robotics Analysis, Systems, Applications**, Niku, S. B., Pearso Education, 2008

REFERENCE BOOKS:

1. **Introduction to Robotics: Mechanica and Control,** Craig, J. J., 2nd :J?:dition, Addison-Welsey, 1989.
2. **Fundamentals of Robotics, Analysis and Control**, Schilling R. J., PHI, 2006

FINANCE MANAGEMENT

Subject Code	**: 10ME767**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Financial Management: Forms of organization, direct and indirect taxes. Statutory Registration- excise Duty, central sales tax, VAT, service tax, international fund availability.

06 Hours

UNIT - 2

Risk And Required Return: Risk and return relationship, methods of measuring the risk, Business risk, financial risk, calculation of expected rate of return to the portfolio, numerical problems.

06 Hours

UNIT - 3

Working Capital Management: Definition, need and factors influencing the working capital requirement. Determination of operating cycle, cash cycle and operating cycle analysis. Calculation of gross working capital and net working capital requirement.

07 Hours

UNIT - 4

Long Term Financing: Raising of finance from primary and secondary markets. Valuation of securities, features of convertible securities and warrants. Features of debt, types of debt instruments, return on investment(ROI) and credit rating of units. Shares, debentures.

07 Hours

PART – B

UNIT - 5

Introduction: Book keeping – systems of book keeping, journal and ledger posting. Financial Statement, Preparation of Trial balance, profit and Loss Account, Balance Sheet with adjustments.

07 Hours

UNIT - 6

Ratio Analysis / Accounting Ratio: Liquidity ratio – Current ratio, quick ratio, turnover ratio, capital structure ratio- Debt – equity ratio, Coverage ratio, Profitability ratio, Profit margin, Return on assets, Activity ratios – Inventory turnover ratio, Debtors Turnover ratio. Preparation of the balance sheet from various ratios. Analysis of any one published balanced sheet.

07 Hours

UNIT - 7

Costing: Classification of cost, preparation of cost sheet, absorption and variable costing, job costing, process costing. Classification of the variances analysis – material, labour and overhead variances.

06 Hours

UNIT - 8

Budgeting: Types of budgets – Flexible budgets, preparation of cash budgets, purchase and production budgets and master budget, Budgetory control, advantages & limitations of budgeting.

06 Hours

TEXT BOOKS:

1. **Financial Management,** Khan & Jain, text & problems, 5th Ed., TMH ISBN 0-07-460208-A. 20001
2. **Financial Accounting, Costing and Management Accounting,** S. M. Maheshwari, 2000

REFERENCE BOOKS:

1. **Financial Management,** I. M. Pandey, Vikas Publication House ISBN 0-7069-5435-1. 2002
2. **Financial Management,** Abrish Gupta, Pearson.
3. **Financial Decision Making,** Humpton. 2000
4. **Financial Management,** Theory and Practice, Prasanna Chandra TMH ISGN -07-462047-9, 3rd edition 2002

MICRO AND SMART SYSTEMS TECHNOLOGY

Subject Code	**: 10ME768**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Micro And Smart Systems:

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.

05 Hours

UNIT - 2

Micro And Smart Devices And Systems: Principles And Materials:

a) Definitions and salient features of sensors, actuators, and systems.

b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator

d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin

08 Hours

UNIT - 3

Micro-Manufacturing And Material Processing:

a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.

b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.

c) Thick-film processing:

d) Smart material processing:

e) Processing of other materials: ceramics, polymers and metals

f) Emerging trends

07 Hours

UNIT - 4

Modeling:

a) Scaling issues.

b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.

c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators.

06 Hours

PART – B

UNIT - 5

Computer-Aided Simulation And Design:

Background to the finite element method. Coupled-domain simulations using Matlab. Commercial software.

08 Hours

UNIT - 6

Electronics, Circuits And Control:

Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.

08 Hours

UNIT - 7

Integration And Packaging Of Microelectro Mechanical Systems:

Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples.

06 Hours

UNIT - 8

Case Studies:

BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

04 Hours

PART – C

UNIT - 9

Mini-projects and class-demonstrations (not for Examination)

09 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)

b) BEL pressure sensor

c) Thermal-cycler for PCR

d) Active control of a cantilever beam

TEXT BOOKS AND A CD-SUPPLEMENT:

1. "Micro and Smart Systems" by Dr. A.K.Aatre, Prof. Ananth Suresh, Prof.K.J.Vinoy, Prof. S. Gopalakrishna,, Prof. K.N.Bhat.,John Wiley Publications
2. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Tsu, Tata Mc-Graw-Hill.

REFERENCE BOOKS:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

3. **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.
4. **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.
5. **Design and Development Methodologies,** Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.
6. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007

PRODUCT LIFE CYCLE MANAGEMENT

Subject Code	**: 10ME769**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT – 1
Introduction to Product Life Cycle Management(PLM) : Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning.

4 Hours

UNIT – 2
PLM Concepts, Processes and Workflow:
Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM.

6 Hours

UNIT – 3
Product Data Management (PDM) Process and Workflow:PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow. Applied problems and solution on PDM processes and workflow.

10 Hours

UNIT – 4

Collaborative Product Development: Engineering vaulting, product reuse, smart parts, engineering change management, Bill of materials and process consistency, Digital mock-up and prototype development, design for environment, virtual testing and validation, marketing collateral.

6 Hours

PART – B

UNIT – 5

Tools of Communication for collaborative work: Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. Applied problems and solutions on tools of communication for collaborative work.

05 Hours

UNIT – 6

Knowledge and optimization of design products: Know how, best practices, parameterization of design, Applied problems and Solution on optimization of products using power copy, publication, parameters, formula, rule, check, design table, configuration, reaction.

10 Hours

UNIT – 7

Digital Manufacturing – PLM: Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning.

06 Hours

UNIT – 8

Developing a PLM strategy and conducting a PLM assessment: Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications**.**

05 Hours

TEXT BOOKS:

1. Product Lifecycle Management : Grieves, Michael, McGraw-Hil, Edition 2006.ISBN 0071452303

2. PDM : Product Data Management : Burden, Rodger, Resource Pub, 2003. ISBN 0970035225.

Suggested Software Packages :

Catia V5R19, Delmia V5R19, 3D via Composer, 3DXML player, Smarteam V5R19

REFERENCE BOOKS :

1. Fabio Guidice, Guido La Rosa, Product Design for the environment-A life cycle approach , Taylor and Francis 2006.
2. Robert J. Thomas, " NDP : Managing and forecasting for strategic processes".
3. Hartman, " Product life cycle management with SAP", 2006
4. Stark, John,"Product Life cycle Management : Paradigm for 21st Century Product Realization ", Springer-Verlag, 2004. ISBN 1852338105
5. Saaksvuori, Antti and Immpnen, Anselmi. " Product Lifecycle Management", Springer-Verlag, 2004. ISBN 3540403736

VIII SEMESTER

OPERATION MANAGEMENT

Subject Code	**: 10ME81**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Production and Operations Management: Introduction, Functions within business organizations, the operation management function, Classification of production systems, Productivity, factors affecting productivity, contemporary issues and development

06 Hours

UNIT - 2

Decision Making: The decision process, characteristics of operations decisions, use of models, decision making environments, graphical linear programming, analysis and trade-offs.

06 Hours

UNIT - 3

Forecasting: Steps in forecasting process, approaches to forecasting, forecasts based on judgment and opinion, analysis of time series data, accuracy and control of forecasts, choosing a forecasting technique, elements of a good forecast,

07 Hours

UNIT - 4

Capacity & Location Planning: Importance of capacity decisions, defining and measuring capacity, determinants of effective capacity, determining capacity requirement, developing capacity alternatives, evaluating alternatives, Need for location decisions, nature of locations decisions, general procedure for making locations decisions, evaluating locations decisions, facilities layout – need for layout decisions, types of processing.

07 Hours

PART – B

UNIT - 5

Aggregate Planning & Master Scheduling: Aggregate planning – Nature and scope of aggregate planning, strategies of aggregate planning, techniques for aggregate planning – graphical and charting techniques, mathematical techniques. The master production schedule, Master scheduling process, Master scheduling methods.

08 hours

UNIT - 6

Inventory Management: Types of Inventories, independent and dependent demand, reasons for holding inventory, objectives of inventory control, requirements for effective inventory management – information, cost, priority system. Inventory control and economic-order-quantity models.

06 Hours

UNIT - 7

Material Requirement Planning (MRP): Dependent versus independent demand, an overview of MRP – MRP inputs and outputs, MRP processing, An overview of MRP-II and ERP capacity requirement planning, benefits and limitations of MRP.

07 Hours

UNIT - 8

Purchasing and Supply Chain Management (SCM): Introduction, Importance of purchasing and SCM, The procurement process, Concept of tenders, Approaches to SCM, Vendor development, Measures of purchasing and SCM, Make or buy decision, Types of buying, E-procurement.

06 Hours

TEXT BOOKS:

1. **Production and Operations Management**, William J Stevenson, 9^{th} Ed., Tata McGraw Hill.
2. **Operations Management-Theory and Practice**, B Mahadevan, Pearson Education, 2007.

REFERENCE BOOKS:

1. **Production and Operations Management,** Norman Gaither & Greg Frazier,
2. **Operations Management for Competitive Advantage**, R.B.Chase, N.J.Aquilino, F. Roberts Jacob; McGraw Hill Companies Inc., Ninth Edition.
3. **Production & Operations Management**, Everett E.Adams, Ronald J.Ebert, Prentice Hall of India Publications, Fourth Edition.
4. **Production / Operations Management**, Joseph G Monks, McGraw Hill Books

CONTROL ENGINEERING

Subject Code	**: 10ME82**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers- Proportional, Integral Proportional Integral, Proportional Integral Differential controllers.

07 Hours

UNIT- 2

Mathematical Models: Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems, pneumatic system, Analogous systems: Force voltage, Force current.

06 Hours

UNIT - 3

Block Diagrams and Signal Flow Graphs: Transfer Functions definition, function, block representation of systems elements, reduction of block diagrams, Signal flow graphs: Mason’s gain formula.

07 Hours

UNIT- 4

Transient and Steady State Response Analysis: Introduction, first order and second order system response to step, ramp and impulse inputs, concepts of time constant and its importance in speed of response. System stability: Routh's-Hurwitz Criterion.

06 Hours

PART - B

UNIT - 5

Frequency Response Analysis: Polar plots, Nyquist stability criterion, Stability analysis, Relative stability concepts, Gain margin and phase margin, M&N circles.

06 Hours

UNIT - 6

Frequency Response Analysis Using Bode Plots: Bode attenuation diagrams, Stability analysis using Bode plots, Simplified Bode Diagrams.

07 Hours

UNIT - 7

Root Locus Plots: Definition of root loci, General rules for constructing root loci, Analysis using root locus plots.

06 Hours

UNIT 8

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test.

07 Hours

TEXT BOOKS :

1. **Modern Control Engineering,** Katsuhiko Ogatta, Pearson Education,2004.
2. **Control Systems Principles and Design,** M.Gopal, 3rd Ed., TMH,2000.

REFERENCE BOOKS :

1. **Modern Control Systems**, Richard.C.Dorf and Robert.H.Bishop, Addison Wesley,1999
2. **System dynamics & control**, Eronini-Umez, Thomson Asia pte Ltd. singapore, 2002.
3. **Feedback Control System**, Schaum's series. 2001.

ELECTIVE-IV (GROUP - D)

TRIBOLOGY

Subject Code	**: 10ME831**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction To Tribology: Properties of oils and equation of flow: Viscosity, Newton's Law of viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, classification of lubricants.

06 Hours

UNIT - 2

Hydrodynamic Lubrication: Friction forces and power loss in lightly loaded bearing, Petroff's law, Tower's experiments, mechanism of pressure development in an oil film, Reynold's investigation and Reynold's equation in 2D.

06 Hours

UNIT - 3

Idealized Journal Bearing: Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's numbers and significance of it; Partial bearings, end leakages in journal bearing, numerical problems.

07 Hours

UNIT - 4

Slider / Pad Bearing With A Fixed And Pivoted Shoe: Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a pivoted shoe bearing, numerical examples.

07 Hours

PART – B

UNIT - 5

Oil Flow And Thermal Equilibrium Of Journal Bearing: Oil flow through bearings, self-contained journal bearings, bearings lubricated under pressure, thermal equilibrium of journal bearings.

06 Hours

UNIT - 6

Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.

06 Hours

UNIT - 7

Bearing Materials: Commonly used bearings materials, properties of typical bearing materials. Advantages and disadvantages of bearing materials.

07 Hours

UNIT - 8

Behavior Of Tribological Components: Selection, friction, Wear of ceramic materials, wear measurements, effects of speed, temperature and pressure. Tribological measures, Material selection, improved design, surface engineering

07 Hours

TEXT BOOKS:

1. **Fundamentals of Tribology** , Basu S K., Sengupta A N., Ahuja B. B., , PHI 2006
2. **Introduction to Tribology Bearings,** Mujumdar B. C., S. Chand company pvt. Ltd 2008.

REFERENEC BOOKS:

1. **Theory and Practice of Lubrication for Engineers,** Fuller, D., New York company 1998
2. **Principles and Applications of Tribology,** Moore, Pergamaon press 1998
3. **Tribology in Industries,** Srivastava S., S Chand and Company limited, Delhi 2002
4. **Lubrication of bearings – Theoretical Principles and Design,** Redzimovskay E I., Oxford press company 2000

FRACTURE MECHANICS

Subject Code	**: 10ME832**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Fracture Mechanics Principles: Introduction, Mechanisms of Fracture, a crack in structure, the Griffith's criterion, modern design – strengths, stiffness and toughness. Stress intensity approach

06 Hours

UNIT - 2

Stress Analysis For Members With Cracks: Linear elastic fracture mechanics, Crack tip stress and deformations, Relation between stress intensity factor and fracture toughness, Stress intensity based solutions. Crack tip plastic zone estimation, Plane stress and plane strain concepts. The Dugdale approach, the thickness effect.

07 Hours

UNIT - 3

Elastic – Plastic Fracture Mechanics: Introduction, Elasto–plastic factor criteria, crack resistance curve, J-integral, Crack opening displacement, crack tip opening displacement. Importance of R-curve in fracture mechanics, experimental determination of J-integral, COD and CTOD.

07 Hours

UNIT - 4

Dynamic And Crack Arrest: Introduction, the dynamic stress intensity and elastic energy release rate, crack branching, the principles of crack arrest, the dynamic fracture toughness.

06 Hours

PART – B

UNIT - 5

Fatigue And Fatigue Crack Growth Rate: Fatigue loading, various stages of crack propagation, the load spectrum, approximation of the stress spectrum, the crack growth integration, fatigue crack growth laws.

07 Hours

UNIT - 6

Fracture Resistance Of Materials: Fracture criteria, fatigue cracking criteria, effect of alloying and second phase particles, effect of processing and anisotropy, effect of temperature, closure.

06 Hours

UNIT - 7

Computational Fracture Mechanics: Overview of numerical methods, traditional methods in computational fracture mechanics – stress and displacement marching, elemental crack advance, virtual crack extension, the energy domain integral, finite element implementation. Limitations of numerical fracture analysis.

07 Hours

UNIT - 8

Fracture Toughness Testing Of Metals: Specimen size requirements, various test procedures, effects of temperature, loading rate and plate thickness on fracture toughness. Fracture testing in shear modes, fatigue testing, NDT methods.

06 Hours

TEXT BOOKS:

1. **Introduction to Fracture Mechanics**, Karen Hellan McGraw Hill Pub.2000
2. **Fracture of Engineering Brittle Materials,** Jayatilake, Applied Science, London. 2001.

REFERENCE BOOKS:

1. **Fracture Mechanics – Fundamentals and Application,** T.L. Anderson, CRC press 1998
2. **Elementary Engineering Fracture Mechanics**, David Broek, Artinus Nijhoff, London 1999.
3. **Fracture and Fatigue Control in Structures**, Rolfe and Barsom, Printice Hall 2000.
4. **Fundamentals of Fracture Mechanics**, Knott, Bureworth 2000.

POWER PLANT ENGINEERING

Subject Code	**: 10ME833**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Steam Power Plant:

Different types of fuels used for steam generation, Equipment for burning coal in lump form, strokers, different types, Oil burners, Advantages and Disadvantages of using pulverised fuel, Equipment for preparation and burning of pulverised coal, unit system and bin system. Pulverised fuel furnaces, cyclone furnace.

7 Hours

UNIT - 2

Coal, Ash Handling and Different Types of Boilers :

Coal and Ash handling, Generation of steam using forced circulation, high and supercritical pressures, A brief account of LaMount, Benson, Velox, Schmidt, Loeffer and Ramson steam generators.

6 Hours

UNIT - 3

Chimneys, Accessories for the Steam Generator Cooling Towers And Ponds:

Natural, forced, induced and balanced draft, Calculations involving height of chimney to produce a given draft. Accessories For The Steam Generator such as super-heaters, desuperheater, control of super heaters, Economisers, Air Pre-heaters Study of different types of cooling towers and ponds.

6 Hours

UNIT - 4

Diesel Engine and Gas Turbine Power Plant:

Method of starting diesel engines, Cooling and lubrication system for the diesel engine. Filters, centrifuges, Oil heaters, Intake and exhaust system, Layout of a diesel power plant.Advantages and disadvantages of the gas turbine plant, Open and closed cycle turbine plants with the accessories.

7 Hours

PART – B

UNIT - 5

Hydro-Electric Plants: Storage and pondage, flow duration and mass curves, hydrographs, Low, medium and high head plants, pumped storage plants, Penstock, water hammer, surge tanks, gates and valves, power house, general layout. A brief description of some of the important Hydel Installations in India.

7 Hours

UNIT - 6

Nuclear Power Plant: Principles of release of nuclear energy Fusion and fission reactions. Nuclear fuels used in the reactors. Multiplication and thermal utilization factors. Elements of the Nuclear reactor, Moderator, control rod, fuel rods, coolants. Brief description of reactors of the following types - Pressurized water reactor, Boiling water reactor, Sodium graphite reactor, Homogeneous graphite reactor and gas cooled reactor, Radiation hazards, Radio active waste disposal.

7 Hours

UNIT - 7

Choice of site for power station, load estimation, load duration curve, load factor, capacity factor, use factor, diversity factor, demand factor, Effect of variable load on power plant, selection of the number and size of units.

6 Hours

UNIT - 8

Economic Analysis of power plant: Cost of energy production, selection of plant and generating equipment, performance and operating characteristics of power plants, tariffs for electrical energy.

6 Hours

TEXT BOOKS:

1. **Power Plant Engineering**, P.K Nag, 3rd Ed. Tata McGraw Hill2nd ed 2001,
2. **Power Plant Engineering.** Morse F.T., Van Nstrand.1998

REFERENCE BOOKS:

1. **Water Power Engg**., Edition 3, Barrows, TMH, New Delhi. 1998
2. **Plant Engg. Hand Book**, Stanier, McGraw Hill. 1998
3. **Hydraulic Machines**, Jagadish Lal, Metropollitan Co 1996.
4. **Principles of Energy Conversion**, A.W. Culp Jr., McGraw Hill. 1996
5. **Power Plant Technology**, M.M. EL-Wakil, McGraw Hill, International. 1994
6. **Power Station Engg. Economics**, Skrotizke and V opat. 1994
7. **Power Plant Engineering,** Domakundawar, Dhanpath Rai sons.2003

NANOTECHNOLOGY

Subject Code	**: 10ME834**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

An Overview Of Nano-Science & Nanotechnology – historical background – nature, scope and content of the subject – multidisciplinary aspects – industrial, economic and societal implications.

05 Hours

UNIT - 2

Experimental Techniques And Methods for investigating and manipulating materials in the nano scale – electron microscope – scanning probe microscope – optical and other microscopes – light scattering – x-ray diffraction.

07 Hours

UNIT - 3

Fullerenes – discovery, synthesis and purification – chemistry of fullerenes in the condensed phase – orientational ordering – pressure effects – conductivity and superconductivity – ferromagnetism – optical properties.

Carbon Nanotubes – synthesis and purification – filling of nanotubes – mechanism of growth – electronic structure – transport properties – mechanical and physical properties – applications.

07 Hours

UNIT - 4

Self-Assembled Monolayers – monolayers on gold – growth process – phase transitions – patterning monolayers – mixed monolayers – applications.

GAS PHASE CLUSTERS – history of cluster science – formation and growth – detection and analysis – type and properties of clusters – bonding in clusters.

07 Hours

PART – B

UNIT - 5

Semiconductor Quantum Dots – synthesis – electronic structure of nanocrystals – how quantum dots are studied – correlation of properties with size – uses.

05 Hours

UNIT - 6

Monolayer-Protected Metal Nanoparticles – method of preparation– characterization – functionalized metal nanoparticles – applications – superlattices.

Core-Shell Nanoparticles – types – characterization – properties – applications.

Nanoshells – types – characterization – properties – applications.

08 Hours

UNIT - 7

Nanobiology – interaction between biomolecules and nanoparticle surfaces – materials used for synthesis of hybrid nano-bio assemblies – biological applications – nanoprobes for analytical applications – nanobiotechnology – future perspectives.

Nanosensors – what make them possible – nanoscale organization for sensors – characterization – nanosensors based on optical properties – nanosensors based on quantum size effects – electrochemical sensors – sensors based on physical properties – nanobiosensors – sensors of the future.

Nanomedicines – approach to development – nanotechnology in diagnostic and therapeutic applications.

08 Hours

UNIT - 8

Molecular Nanomachines – covalent and non-covalent approaches – molecular motors and machines – other molecular devices – single molecular devices – practical problems involved.

Nanotribology – studying tribology on the nanoscale – applications.

05 Hours

TEXT BOOKS:

1. **NANO: The Essentials – Understanding Nanoscience and Nanotechnology;** T Pradeep (Professor, IIT Madras); Tata McGraw-Hill India (2007)
2. **Nanotechnology:** Richard Booker & Earl Boysen; Wiley (2005).

REFERENCE BOOKS:

1. **Introduction to Nanoscale Science and Technology [Series: Nanostructure Science and Technology],** Di Ventra, et al (Ed); Springer (2004)
2. **Nanotechnology Demystified,** Linda Williams & Wade Adams; McGraw-Hill (2007)
3. **Introduction to Nanotechnology,** Charles P Poole Jr, Frank J Owens, Wiley India Pvt. Ltd., New Delhi, 2007.

ORGANIZATIONAL BEHAVIOUR & PROFESSIONAL COMMUNICATION

Subject Code	**: 10ME835**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1
Introduction: Definition of Organization Behaviour and Historical development, Environmental context (Information Technology and Globalization, Diversity and Ethics, Design and Cultural, Reward Systems).
06 Hours

UNIT - 2
The Individual: Foundations of individual behaviour, individual differences. Ability. Attitude, Aptitude, interests. Values.
07 Hours

UNIT - 3
Learning: Definition, Theories of Learning, Individual Decision Making, classical conditioning, operant conditioning, social learning theory, continuous and intermittent reinforcement.
07 Hours

UNIT - 4
Perception: Definition, Factors influencing perception, attribution theory, selective perception, projection, stereotyping, Halo effect**.**
06 Hours

PART – B

UNIT - 5
Motivation: Maslow's Hierarchy of Needs theory, Mc-Gregor's theory X and Y, Hertzberg's motivation Hygiene theory, David Mc-Clelland’s three needs theory, Victor Vroom's expectancy theory of motivation**.**
06 Hours

UNIT - 6

The Groups: Definition and classification of groups, Factors affecting group formation, stages of group development, Norms, Hawthorne studies, group processes, group tasks, group decision making**.**

06 Hours

UNIT - 7

Conflict & Stress Management: Definition of conflict, functional and dysfunctional conflict, stages of conflict process**.** Sources of stress, fatigue and its impact on productivity. Job satisfaction, job rotation, enrichment, job enlargement and reengineering work process**.**

08 Hours

UNIT - 8

Principles Of Communication: Useful definitions, communication principles, communication system, role of communication in management, barriers in communication, how to overcome the barriers, rule of effective communication**.**

06 Hours

TEXT BOOKS:

1. **Organizational Behaviour,** Stephen P Robbins, 9th Edition, Pearson Education Publications, ISBN-81-7808-561-5 2002
2. **Organizational Behaviour,** Fred Luthans, 11th Edition, Mc Graw Hill International Edition, ISBN-0-07-120412-12002

REFERENCE BOOKS:

1. **Organizational Behaviour,** Hellriegel, Srocum and Woodman, Thompson Learning, 9th Edition, Prentice Hall India, 2001
2. **Organizational Behaviour,** Aswathappa - Himalaya Publishers. 2001
3. **Organizational Behaviour,** VSP Rao and others, Konark Publishers.2002
4. **Organizational Behaviour,** (Human behaviour at work) 9th Edition, John Newstron/ Keith Davis. 2002

COMPUTER GRAPHICS

Subject Code	**: 10ME836**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Scan Conversion and Clipping Representation of points, lines, Line Drawing Algorithms: DDA algorithm, Bresenham's integer line algorithm, Bresenham's circle algorithm, mid point line and circle, Polygon filling algorithms: scan conversion, seed filling, scan line algorithm. Viewing transformation, Clipping –points, lines, text, polygon, Cohen-Sutherland line clipping, Sutherland-Hodgmen algorithm.

07 Hours

UNIT - 2

Two Dimensional Transformations Representation of points, Transformations: Rotation, Reflection, Scaling, Combined Transformations, Translations and Homogeneous Coordinates, A geometric interpretation of homogeneous coordinates, Over all scaling, Points at infinity, rotation about an arbitrary point, Reflection through an arbitrary line.

06 Hours

UNIT - 3

Three Dimensional Transformations and Projections 3D Transformation matrix: general matrix, Translation, scaling, Shearing, Rotation, Reflection, Multiple transformations, Rotation about an axis parallel to coordinate axis, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Orthographic, Parallel projection Transformations, one, Perspective projections- one point, two point and three point.

06 Hours

UNIT - 4

Plane and Space Curves Curve representation, Nonparametric curves, parametric curves, parametric representation and generation of line, circle, ellipse, parabola, hyperbola, generation of circle, ellipse, parabola, hyperbola, Cubic spline, normalized cubic splines, Bezier curves: blending function, properties, generation, B-spline curves- Cox-deBoor recursive formula,properties,open uniform basis functions, Non-uniform basis functions, periodic B-spline curve.

07 Hours

PART – B

UNIT - 5

Types and Mathematical Representation of Solids, Solid Models, Solid entities, Solid representation, Solid modeling- set theory, regularized set operations, set membership classification, Half spaces, Half spaces of plane, cylinder, sphere, conical half-space, Boundary representation, Constructive Solid Geometry- basic elements, Building operations.

07 Hours

UNIT - 6

VISUAL REALISM-I: Introduction, hidden line removal- visibility of object views, Visibility techniques: minimax test, containment test, surface test, Silhouttes, Homogeneity test, Sorting, Coherence, Hidden line priority algorithm, Hidden surface removal- Z-buffer algorithm, Warnock's algorithm, Hidden solid removal- ray tracing algorithm.

06 Hours

UNIT - 7

VISUAL REALISM-II: Shading, shading models- diffuse reflection, specular reflection, ambient light, Shading surfaces- constant shading, gourmand shading, Phong shading, Shading enhancements, Shading Solids- Ray tracing for CSG, z- buffer algorithm for B-rep and CSG, octree encoded objects, Colouring- RGB, CMY, HSV, HSL colour models.

07 Hours

UNIT - 8

COMPUTER ANIMATION: Introduction, Conventional animation-key frame, Inbetweening, Line testing, Painting, Filming, Computer animation-entertainment and engineering animation, Animation system hardware, software architecture, Animation types- frame buffer, colour table, zoom-pan-scroll, cross bar, real time play back, Animation techniques- key frame, skelton. Path of motion and p-curves.

06 Hours

TEXT BOOKS:

1 **CAD/CAM-Theory and Practice,** Ibraham Zeid, 2nd Ed., McGraw Hill, 2006
2 **Mathematical Elements for Computer Graphics**, Rogoer's Adams, McGraw Hill. 1990

REFERENCE BOOKS:

1. **Computer Graphics**, Xiang z, Plastock, R. A., Schaums outlines, McGraw Hill. 2007.
2. **Computer Graphics, principles and practice,** .Foley, Van- Damn, Finner and Hughes, Addison Wesley. 2000
3. **Computer Graphics,** Sinha A. N., Udai A. D., Tata McGraw Hill, 2008.
4. **Computer Graphics,** C Version- Doneld Heran, M. Pauline Baker, 2^{nd} Edition, Pearson.

RAPID PROTOTYPING

Subject Code	**: 10ME837**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.

Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

07 Hours

UNIT - 2

Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications.

Fusion Deposition Modelling: Principle, Process parameter, Path generation, Applications.

07 Hours

UNIT - 3

Solid Ground Curing: Principle of operation, Machine details, Applications. Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, application.

06 Hours

UNIT - 4
Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.

06 Hours

PART – B

UNIT - 5
Rapid Tooling: Indirect Rapid tooling, Silicon rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, Cast kirksite, 3Q keltool, etc. Direct Rapid Tooling Direct. AIM.

06 Hours

UNIT - 6
Rapid Tooling: Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

06 Hours

UNIT - 7
Software For RP: STL files, Overview of Solid view, magics, imics, magic communicator, etc. Internet based software, Collaboration tools.

06 Hours

UNIT - 8
Rapid Manufacturing Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation.

08 Hours

TEXT BOOKS:
1. **Stereo Lithography and other RP & M Technologies,** Paul F. Jacobs: SME, NY 1996.
2. **Rapid Manufacturing,** Flham D.T & Dinjoy S.S Verlog London 2001.

REFERENCE BOOKS:
1. **Rapid Prototyping,** Terry Wohlers Wohler's Report 2000" Wohler's Association 2000.
2. **Rapid Prototyping Materials,** Gurumurthi, IISc Bangalore.
3. **Rapid Automated,** Lament wood. Indus press New York

FOUNDRY TECHNOLOGY

Subject Code	**: 10ME838**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Foundry Metallurgy: Oxidation of liquid metals, gas dissolution in liquid metals, methods of degassing, fluidity, factors affecting fluidity, fluidity tests, hot tearing, shrinkage of liquid metals.

06 Hours

UNIT - 2

Casting Design: Introduction to casting design, redesign considerations, design for minimum casting stresses, design for directional solidification, design for metal flow, safety factors, design for low pattern cost and model making as an aid in design.

06 Hours

UNIT - 3

Solidification Of Castings: Crystallization and development of cast structure - nucleation, growth and dendritic growth. Structure of castings - significance and practical control of cast structure, grain shape and orientation, grain size, refinement and modification of cast structure. Concept of progressive and directional solidification, solidification time and derivation of Chvorinov's equation, influence on mold characteristics and cast metal.

07 Hours

UNIT - 4

Risering And Gating: Need for risering, general considerations of risering, riser shapes, riser size, and location. Requirements of a riser. Sand, insulating, and exothermic materials used for risers. Riser feeding distance and theory of risering. Internal chills, external chills, use of mould materials of different chill capacities, padding for directional solidification. Open type and blind risers. Riser treatment using exothermic and insulating compounds. Gating system – theoretical consideration of gating, laws of fluid flow, turbulence in gating system, use of ceramic foam filters in gating, need for tapered sprue, gating ratio, simple problems.

07 Hours

PART – B

UNIT - 5

Special Moulding Techniques: Principles, materials used, process details and application of no-bake sand systems, vacuum moulding, flaskless moulding, and high pressure moulding.

CUPOLA MELTING: Developments in cupola melting – hot blast cupola, water cooled cupola, balanced blast cupola, cokeless cupola, cupola charge calculations.

07 Hours

UNIT - 6

Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical steels, grey cast iron, malleable iron, and spheroidal graphite cast iron castings.

07 Hours

UNIT - 7

Non-Ferrous Foundry: Melting procedures, casting characteristics, production, specification, and properties of some typical aluminum, copper, and magnesium based alloy castings.

06 Hours

UNIT - 8

Modernization And Mechanization Of Foundry: Need for modernization, and mechanization, moulding and core making, melting, pouring, shake out equipment and fettling, dust and fume control, material handling equipments for sand moulds and cores, molten metal and castings, reclamation of sands. Pollution control – norms, and agencies.

06 Hours

TEXT BOOKS:

1. **Principles of metal casting,** Heine Loper & Rosenthal TMH - 2005
2. **Principle of Foundry Technology**, P. L. Jain, 5th Ed., TMH – 2006.

REFERENCE BOOKS:

1. **Castings,** John Campbell, Second edition, Elseivier
2. **Foundry Technology,** P. N. Rao
3. **Manufacturing Process,** I, Dr. K. Radha Krishna 5th Edn. Sapna Book House, Bangalore

ELECTIVE-V (GROUP - E)

MACHINE TOOL DESIGN

Subject Code	**: 10ME841**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Principles Of Machine Tool Design: General requirements of machine tool design - design process machine tool layout general requirements of machine tool design – design process machine tool layout

05 Hours

UNIT - 2

Machine Tool Drives And Mechanisms: Working and auxiliary motion. Drives- Electric drives, Hydraulic transmission, Kinmatic structure, Regulation of speed and feeds, stepped regulation, standardization of speed and feed, stepless regulation of speeds and feeds.

07 Hours

UNIT - 3

Cutting Force Analysis And Power Requirement: In Turning, Milling, Drilling, Shaping and Broaching operation with simple problems. General requirements of machine tools - Centre lathe, Milling machine.

07 Hours

UNIT - 4

Design Of Machine Tool Structures: Functions-Requirements-Design criteria Material used – static and dynamic stiffness – Profile and basic design procedure for machine tool structures. Design of beds, columns, housing, bases, tables, cross-rails, arms saddle, carriages.

07 Hours

PART - B

UNIT - 5

Design Of Guide Ways And Power Screws: Function and types of guide ways – Design and lubrication of slide ways - aerostatic slide ways -

antifriction guide ways, combination guide ways - protecting devices, design of power screws.

06 Hours

UNIT - 6

Design Of Spindle And Spindle Bearings: Functions-Requirements and materials for spindle compliance and machining accuracy. Design of spindles, antifriction bearing, Hydrodynamic and Hydrostatic bearing, Air lubricated bearing.

06 Hours

UNIT - 7

Dynamics Of Machine Tools: Concept of dynamic cutting process, Physical causes of chatter and vibrations, Types of Chatter. Stability chart, chatter vibration in Lathe, Drilling machine, Grinding machine and Milling machine. Different methods for avoiding machine tool chatter and vibration.

07 Hours

UNIT - 8

Control Systems In Machine Tools: Functions, requirements and classification. Control system for speed and feeds centralized control pre selective control, control system for forming and auxiliary motions – Mechanical control– Ergonomic consideration and compatibility – Automatic control system – Electric Hydraulic and pneumatic systems.

07 Hours

TEXT BOOKS:

1. **Machine Tool Design,** N.K. Mehta, 2nd Ed., Tata McGraw Hill 2001
2. **Principles of Machine Tools,** Sen and Bhattacharaya Oxford IBM Publishing 2000

REFERENCE BOOKS:

1. **Machine Tool Design Volume – II and III,** N. Acharkan MIR Publications 2000
2. **Design of Machine Tools**, S. K. Basu and D. K. Pal 2000
3. **Principles of Machine Tool Design**, Koensberger 1993

INDUSTRIAL ENGINEERING AND ERGONOMICS

Subject Code	**: 10ME842**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1

Productivity & Work Study: Definition of productivity, factors affecting productivity, definition, objective & scope of work study, human factors in work study, work study & management, work study & supervisor, work study &worker.

06 Hours

UNIT - 2

Method Study: Definition, objective & scope, charts to record movements in shop, process charts, flow process charts, Multiple activity charts, two handed process charts, SIMO chart, principles of motion economy.

08 Hours

UNIT - 3

Work Measurement: Definition, objectives, techniques of work measurement, work sampling, need of confidence levels, sample size determination, random observation with simple problems

06 Hours

UNIT - 4

Time Study: Definition, time study equipments, selection of jobs, steps in time study, breaking jobs into elements, recording information, rating, standard performance, scales of rating, factors affecting rate of working, allowances, standard time determination.

06 Hours

PART – B

UNIT - 5

Introduction To Industrial Design: elements of design structure for industrial design in engineering application in modern manufacturing systems.

Ergonomics and Industrial Design: Introduction, general approach to the man-machine relationship, workstation design-working position.

08 Hours

UNIT - 6

Visual Effects Of Line And Form: The mechanics of seeing-psychology of seeing general influences of line and form.

06 Hours

UNIT - 7

Color Models: RGB, CMY, HSV, Color and light, color and objects-color and the eye-color consistency-color terms reactions to color and color continuation-color on engineering equipments.

06 Hours

UNIT - 8

Aesthetic Concepts: Concept of unity-concept of order with variety-concept of purpose style and environment –Aesthetic expressions. Style –components of style house style, observation style in capital goods, case study.

06 Hours

TEXT BOOKS:

1. **Work study,** ILO, 3rd edition, 2006
2. **Human Factor Engineering**: Sanders & McCormick, 7th Ed., McGraw Hill Publications.

REFERENCE BOOKS:

1. **Applied Ergonomics Hand Book,** Brain Shakel, Butterworth Scientific, London 1988
2. **Introduction to Ergonomics,** R. C. Bridger, McGraw Hill Publications.
3. **Industrial Design for Engineers,** Mayall W. H. London Hiffee Books Ltd., 1988
4. **Work Study & Ergonomics,** Suresh Dalela & Saurabh, standard publishers & distributors,1999

BIOMASS ENERGY SYSTEMS

Subject Code	**: 10ME843**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT - 1
Introduction: Biomass energy sources, energy content of various Bio – fuels, Energy plantation, origin of Biomass photo synthesis process, Biomass Characteristics, sustainability of Biomass.

06 Hours

UNIT - 2
Biomass Conversion Methods: Agrochemical, Thermochemical, Biochemical (flowchart) & Explanation.

06 Hours

UNIT - 3
Physical & Agrochemical Conversion: Briquetting, Pelletization, Agrochemical, fuel Extraction, Thermo chemical Conversion: Direct combustion for heat, Domestic cooking & heating.

07 Hours

UNIT - 4
Biomass Gasification: Chemical reaction in gasification, Producergas& the constituents, Types of gasifiers. Fixed bed gasifiers, Fluidized bed gasifiers.Liquefaction: Liquefaction through pyrolysis & Methanol synthesis, application of producer gas in I C Engines.

07 Hours

PART – B

UNIT - 5
Bio-Methanization: Anaerobic digestion, Basic principles, factors influencing Biogas yield, classification of Biogas digester, floating gasholder & fixed dome type.(Working Principle with diagram), Calculations for sizing the Biogas plant.

06 Hours

UNIT - 6

Biogas For Power Generation: Ethanol as an automobile fuel, Ethanol production & its use in engines.

06 Hours

UNIT - 7

Bio - Diesel: Bio Diesel from edible & non-edible oils, Production of Bio diesel from Honge & Jatropha seeds, use of bio diesel in I C engines, Engine power using Bio diesel, Blending of Bio diesel, Performance analysis of diesel engines using bio diesel. Effect of use of bio diesel in I C engines.

07 Hours

UNIT - 8

Bio Power Plants: Bio Power generation routes, Basic Thermodynamic cycles in Bio power generation; Brayton cycle, Sterling cycle, Rankine cycle, Co-generation cycle. Biomass based steam power plant.

07 Hours

TEXT BOOKS:

1. **Bio Gas Technology,** B.T. Nijaguna. New Age International- New Delhi.2001-02
2. **Energy Technology,** S. Rao & B. B. Parulekar – Khanna Publishers, Delhi-1999.
3. **Non Conventional Energy Sources,** G. D. Rai - Khanna Publishers. Delhi.

REFERENCE BOOKS:

1. **Greenhouse Technology for Controlled Environment,** G.N. Tiwari, Alpha Science International Ltd., Pangbourne.England.
2. **Renewable Energy Resources,** John.W.Twidell, Anthony. D. Weir, EC BG-2001.
3. **BioMass, Deglisc. X and P. Magne,** Millennium Enterprise, New Delhi.

AUTOMOTIVE ENGINEERING

Subject Code	**: 10ME844**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Engine Components And Cooling & Lubrication Systems: Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

07 Hours

UNIT - 2

Fuels, Fuel Supply Systems For Si And Ci Engines: Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

07 Hours

UNIT - 3

Superchargers And Turbochargers: Naturally aspirated engines, Forced Induction, Types pf superchargers, Turbocharger construction and operation, Intercooler, Turbocharger lag.

06 Hours

UNIT - 4

Ignition Systems: Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

06 Hours

PART – B

UNIT - 5

Power Trains: General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, Single plate, multi-plate and centrifugal clutches.

Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3, 4 and 5 speed gear boxes. Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches.

08 Hours

UNIT - 6

Drive To Wheels: Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, numerical problems, types of chassis frames.

06 Hours

UNIT - 7

Suspension, Springs And Brakes: Requirements, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system.

Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock –Braking systems, purpose and operation of antilock-braking system, ABS Hydraulic Unit, Rear-wheel antilock & Numerical Problems

06 Hours

UNIT - 8

Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards- Euro I, II, III and IV norms, Bharat Stage II, III norms.

6 Hours

TEXT BOOKS:

1. **Automotive mechanics,** William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007
2. **Automotive Mechanics,** S. Srinivasan, 2nd Ed., Tata McGraw Hill 2003.

REFERENCE BOOKS:

1. **Automotive mechanics: Principles and Practices**, Joseph Heitner, D Van Nostrand Company, Inc
2. **Fundamentals of Automobile Engineering,** K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.
3. **Automobile Engineering**, R. B. Gupta, Satya Prakashan, 4th edn. 1984.
4. **Automobile engineering**, Kirpal Singh. Vol I and II 2002.

DATABASE MANAGEMETN SYSTEM

Subject Code	**: 10ME845**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Database And Database Users: Introduction, characteristics of database approach, intended uses of a DBMS, advantages and implementation of database approach.

06 Hours

UNIT - 2

Database Systems Concepts And Architecture: Data models, schemes and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of database management systems.

06 Hours

UNIT - 3

Data Modeling: High level conceptual data models for database design. Entity types, entity sets, attributes and keys, Relationships, relationship types, roles and structural constraints. Weak entity types, ER diagram and design issue.

08 Hours

UNIT - 4

Record Storage And Primary File Organizations: Secondary storage devices, buffering of the blocks, placing file records on the disk, operations on files, heap files and sorted files, hashing techniques.

06 Hours

PART – B

UNIT - 5

Relational Data Model And Relational Algebra: Brief discussion on code rules, relational model concepts, constraints and schemas. Update operation on relations, basic and additional relational algebra operations, queries in relational algebra.

07 Hours

UNIT - 6

Structural Query Language (Sql): Data definition etc., in SQL2. Basic and complex queries in SQL, Inser, Delete; Update statements, and views in SQKL, embedded SQL.

07 Hours

UNIT - 7

Database Design: Design guidelines for relational schemas, functional dependencies, normalization 1^{st}, 2^{nd}, 3^{rd}, 4^{th} and 5^{th}; normal forms. Database design process, factors influencing physical database design guidelines, and guidelines for relational systems.

07 Hours

UNIT - 8

System Implementation: System catalogue for RDBMSs, transaction processing, and system concepts, properties of transaction, brief discussion on concurrency control and recovery techniques, database security and authorization.

05 Hours

TEXT BOOKS:

1. **Fundamentals of Database Systems,** Ramez Elmasri and Shanmkanth B. Navathe, 3rd Edition, Addison Pearson.
2. **Database Management System,** Raghu Ramakrishnan, Tata Mc Graw Hill, 3rd Edn. 2002.

REFERENCE BOOKS:

1. **Database Management and Design,** Gray W.hansen and James V. Hansen, 2nd Edn. Printice Hall India Pvt. Ltd., 2002.
2. **Database Management Systems,** Designing and Building business applications by Gerald V. Post, 3rd Edition, Tata Mc Graw Hill Publishing company Ltd.,- 2005
3. **Project Mangment with PERT and CPM,** Moder Joseph J and Phillips cerel, R., VAN Noserand, Reinhold, 2nd Edn., 1976.

ARTIFICIAL INTELLIGENCE

Subject Code	**: 10ME846**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1

Artificial Intelligence: Introduction, definition, underlying assumption, importance of AI & AI related fields.

06 Hours

UNIT - 2

Space Representation: Defining a problem. Production systems and its characteristics, Search and Control strategies – Generate and Test, Hill Climbing, Best – first Search, Problem reduction, Constraint Satisfaction, Means – Ends Analysis.

07 Hours

UNIT - 3

Knowledge Representation Issues: Representations and Mappings, Types of knowledge – Procedural Vs Declarative, Logic programming. Forward Vs Backward reasoning, Matching.

07 Hours

UNIT - 4

Use Of Predicate Logic: Representing simple facts, Instance and Isa relationships, Syntax and Semantics for Prepositional logic, FQPL and properties of Wffs, Conversion to Clausal form, Resolution, Natural deduction.

06 Hours

PART – B

UNIT - 5

Statistical And Probabilistic Reasoning: Symbolic reasoning under uncertainty, Probability and Bayes' theorem, Certainity factors and Rule based systems, Bayesian Networks, Shafer Theory, Fuzzy Logic.

07 Hours

UNIT - 6

Expert Systems: Structure and uses, Representing and using domain knowledge, Expert System Shells. Pattern recognition Learning classification patterns, recognizing and understanding speech. Introduction to knowledge Acquisition, Types of Learning.

07 Hours

UNIT - 7

Typical Expert Systems: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF, ETC.

06 Hours

UNIT - 8

Introduction To Machine Learning: Perceptrons, Checker Playing Examples, Learning Automata, Genetic Algorithms, Intelligent Editors.

06 Hours

TEXT BOOKS:

1. **Artificial Intelligence,** Elaine Rich & Kevin Knight, 3rd Ed., M/H 1983.
2. **Introduction to AI & ES,** Dan W. Patterson, Prentice Hall of India, 1999.

REFERENCE BOOKS:

1. **Principles of Artificial Intelligence**, Springer Verlag, Berlin, 1981.
2. **Artificial Intelligence in business, Science & Industry**, Wendy B. Ranch

3. **A guide to expert systems,** Waterman, D.A., Addison – Wesley inc. 1986
4. **Building expert systems,** Hayes, Roth, Waterman, D.A. Addison – Wesley, 1983

DESIGN OF EXPERIMENTS

Subject Code	**: 10ME847**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART – A

UNIT - 1
Introduction: Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments.

05 Hours

UNIT - 2
Basic Statistical Concepts: Concepts of random variable, probability, density function cumulative distribution function. Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level. Statistical Distributions: Normal, Log Normal & Weibull distributions. Hypothesis testing, Probability plots, choice of sample size. Illustration through Numerical examples.

07 Hours

UNIT - 3
Experimental Design: Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustration through Numerical examples.

07 Hours

UNIT - 4

Analysis And Interpretation Methods: Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data. Illustration through Numerical examples.

07 Hours

PART – B

UNIT - 5

Quality By Experimental Design: Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust Design: Steps in Robust Design: Parameter design and Tolerance Design. Reliability Improvement through experiments, Illustration through Numerical examples.

06 Hours

UNIT - 6

Experiment Design Using Taguchi's Orthogonal Arrays: Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.

08 Hours

UNIT - 7

Signal To Noise Ratio: Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smaller-the-better type, Nominal-the –better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples.

06 Hours

UNIT - 8

Parameter And Tolerance Design: Parameter and tolerance design concepts, Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustration through Numerical examples.

06 Hours

TEXT BOOKS:

1. **Design and Analysis of Experiments,** Douglas C. Montgomery, 5^{th} Edition Wiley India Pvt. Ltd. 2007
2. **Quality Engineering using Robust Design,** Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, New Jersy 07632, 1989.

REFERENCE BOOK:

1. **Quality by Experimental Design,** Thomas B. Barker, Marcel Dekker, Inc ASQC Quality Press.1985.
2. **Experiments Planning, analysis, and parameter Design optimization,** C.F. Jeff Wu Michael Hamada, John Wiley Editions. 2002.
3. **Reliability Improvement by Experiments,** W.L. Condra, Marcel Dekker, Inc ASQC Quality Press.1985.
4. **Taguchi Techniques for Quality Engineering,** Phillip J. Ross, 2^{nd} Edn. McGraw Hill International Editions, 1996.

DESIGN FOR MANUFACTURING AND ASSEMBLY

Subject Code	**: 10ME848**	**IA Marks**	**: 25**
Hours/Week	**: 04**	**Exam Hours**	**: 03**
Total Hours	**: 52**	**Exam Marks**	**: 100**

PART - A

UNIT-1

Tolerances, Limits & Fits: General Tolerances, Tolerance grades, Limits fundamental deviation, Fits, Tolerance Accumulation cumulative effect of tolerances in assembly. Relationship between attainable tolerance grades and different machining processes.

06 Hours

UNIT-2

Geometric Tolerances: Geometrical characteristics and symbols. Definition and Measurement of circularity, cylindricity, flatness and runout. True position tolerance.

Surface Roughness : Terminology, Terms used for surface roughness, measurement of surface roughness. Surface roughness values obtained from various machining processes.

08 Hours

UNIT-3

Cumulative Effect Of Tolerances: sure fit law and truncated normal law. Selective assembly and interchangeable part manufacture, Control of axial play by introducing secondary machining processes and by adding laminated shims.

06 Hours

UNIT-4

Statistical Quality Control: Frequency distribution, standard deviation concept of skewness & Kurtosh variance, Process capability, Indices C_p and C_{pk} control charts.

06 Hours

PART – B

UNIT-5

Component Design From Casting Considerations: Pattern, Mould, Parting line, cored holes and machined holes, Design for reducting/eliminating sand cores.

06 Hours

UNIT-6

Component Design From Machining Consideration: Design considerations for turning, drilling, tapping, milling and grinding operations, provisions for clamping, Reduction in machining area, simplification by separation and amalgamation, Use of productive machines.

06 Hours

UNIT-7

Design Considerations: Major Design Phases. Design for Manufacturability consideration. Influence of Fabrication properties (Machinability, Castability, Weldability, Polymer processing).

07 Hours

UNIT-8

Selection Of Materials In Design: Properties of Materials used in design. Material selection process – cost per unit property, weighted properties and limits on properties methods.

07 Hours

TEXT BOOKS:

1. **Design for Manufacture,** Harry Peck,Pitman Publications,1983.
2. **Engineering Metrology,** R.K. Jain Khanna Publishers,2000.

REFERENCE BOOKS:

1. **ASM Handbook,vol.20.** Material selection & Design.
2. **Design for Manufacturability Handbook,** Jamesh G. Baralla, Editor, Mcgraw Hill 1998.
3. **Product Design for Manufacture and Assembly,** Geoffery Boothroyed et al ‘Mercel Dekker Inc. New York.
4. **Engineering Design: A Materials and Processing Approach,** Geaorge. E. Dieter, Mcgraw Hill, 1991.

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