COCHIN UNIVERSITY OF SCIENCE & TECHNOLOGY

Scheme for I to VIII

B.TECH ELECTRICAL & ELECTRONICS ENGINEERING

(2006 Admission onwards)

B.TECH ELECTRICAL & ELECTRONICS ENGINEERING

NB: ***For all practicals from semester I & II to semester VII, 50% weightage is to be given for continuous evaluation and 50% for end semester examination***

Semester I & II (Common to all branches)

Course Code	Subject Name	Hrs./ week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE **101**	Engineering Mathematics I	3		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **102**	Engineering Physics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **103**	Engineering Chemistry	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **104**	Engineering Mechanics	3	1	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **105**	Engineering Graphics	1	3	50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **106**	Basic Civil & Mechanical Engineering	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **107**	Basic Electrical Engineering & Electronics	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **108**	Computer Programming	2		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **109**	Technical Communication & Social Sciences	3*		50	100	150
CE/CS/EB/EC/EE/ EI/IT/ME/SE **110**	Computer Programming Lab		3	100		100
CE/CS/EB/EC/EE/ EI/IT/ME/SE **111**	Electrical & Mechanical Workshops		3	100		100
	Total	**20**	**10**	**650**	**900**	**1550**

*** 1 hour/week for environmental studies**

Semester III

Course Code	Subject Name			Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/ EI/IT/ME/SE **301**	Engineering Mathematics II	4		50	100	150
EE **302**	Fluid Mechanics & Heat Engines	4		50	100	150
CE/EE **303**	Strength of Materials	4		50	100	150
EE **304**	Electric Circuit Theory	4		50	100	150
EE **305**	Electrical Measurements & Measuring Instruments	4		50	100	150
CS/EB/EE **306**	Electronic Devices and Circuits	4		50	100	150
CS/EE **307**	Electronic Circuits Lab		3	100		100
EE **308**	Basic Electrical Engineering Lab		3	100		100
	Total	**24**	**6**	**500**	**600**	**1100**

Semester IV

Course Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/EI/ IT/ME/SE **401**	Engineering Mathematics III	4		50	100	150
EE **402**	Logic Design	4		50	100	150
EE **403**	Electrical Machines I	4		50	100	150
EE **404**	Linear System Analysis	4		50	100	150
EC/EE **405**	Analog Communication	4		50	100	150
EC/EB/EI/EE **406**	Industrial & Power Electronics	4		50	100	150
CS/EB/EI/EC/EE **407**	Digital Electronics Lab		3	100		100
EE **408**	Electrical Measurements Lab		3	100		100
	Total	**24**	**6**	**500**	**600**	**1100**

Semester V

Subject Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
CE/CS/EB/EC/EE/EI/ IT/ME/SE **501**	Engineering Mathematics IV	4		50	100	150
EE **502**	Electrical Machines II	4		50	100	150
EE **503**	Field Theory	4		50	100	150
EE **504**	Engineering Material Science	4		50	100	150
EE **505**	Microprocessor Based Systems	4		50	100	150
EE **506**	Linear Integrated Circuits	4		50	100	150
EE **507**	Electrical Machines I Lab		3	100		100
EE **508**	Power Electronics Lab		3	100		100
	Total	**24**	**6**	**500**	**600**	**1100**

Semester VI

Subject Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
EE **601**	Power Systems I	4		50	100	150
CS/EE **602**	Digital Signal Processing	4		50	100	150
EE **603**	Control Systems I	4		50	100	150
EE **604**	Electrical Drawing	4		50	100	150
EE **605**	Modern Communication Engineering	4		50	100	150
EE **606**	Electrical Machines III	4		50	100	150
EE **607**	Microprocessor Lab		3	100		100
EE **608**	Mini Project		3	100		100
	Total	**24**	**6**	**500**	**600**	**1100**

Semester VII

Subject Code	Subject Name	Hrs./week		*Marks*		
		L	T/D/P	Internal	University	Total
CS/EB/EC/EE/EI/IT **701**	Industrial Organization and Management	4		50	100	150
EE **702**	Design Estimation & Costing	4		50	100	150
EE **703**	Power Systems II	4		50	100	150
EE **704**	Control Systems II	4		50	100	150
EE **705**	Elective I	4		50	100	150
EE **706**	Electrical Machines II Lab		3	100		100
EE **707**	Advanced Electrical Engineering Lab		3	100		100
EE **708**	Seminar		2	50		50
EE **709**	Project Design		2	50		50
	Total	**20**	**10**	**550**	**500**	**1050**

Elective I

EB/EE 705 A: Computer Communications
EE 705 B: High Voltage DC Transmission
EE705 C: Neural Network & Fuzzy Logic
EE 705 D: Optimal Control Theory

Semester VIII

Subject Code	Subject Name	Hrs./week		Marks		
		L	T/D/P	Internal	University	Total
EE **801**	Electrical Machine Design	4		50	100	150
EE **802**	Power Systems III	4		50	100	150
EE **803**	Electronic Instrumentation	4		50	100	150
EE **804**	Elective II	4		50	100	150
EE **805**	Project Work		14	300		300
EE **806**	Viva-voce				100	100
	Total	**16**	**14**	**500**	**500**	**1000**
Grand Total				**3700**	**4300**	**8000**

Elective II

CS/EC/EE/EI 804 A: Digital Image Processing
EE 804 B: Renewable Sources of Energy
EE 804 C: Flexible AC Transmission
EB/EE 804 D: VLSI Design

CE/CS/EB/EC/EE/EI/IT/ME/SE 101 ENGINEERING MATHEMATICS I

MODULE I

Ordinary differential equations: First order differential equations-Methods of solution and Simple applications- Linear differential equations of higher orders with constant co-efficients-Methods of solution of these equations. Cauchy's linear differential equations. Simultaneous linear differential equations- Simple applications of linear differential equations in engineering problems –Electrical Circuits, Mechanical Systems

MODULE II

Infinite series: Integral test, comparison test, ratio test, Cauchy's root test, Raabe's test, series of positive and negative terms, concept of absolute convergence, alternating series, Leibniz test (No proofs for any of the above tests)

Power series : Internal of convergence of power series, Taylor and Maclaurin series of functions, Leibniz formula for the nth derivative of the product of two functions (No proof),use of Leibniz formula for the determination of co-efficients of the power series.

MODULE III

Partial differentiation: Partial differentiation-Concept of partial derivative - Chain rule- Total derivative- Euler's theorem for homogeneous functions, Differentials and their applications in errors and approximations, Jacobians - Maxima minima of functions of two variables(Proof of the result not required)-Simple applications.

Taylors series expansion for a function on two variables-Simple problems

Co-ordinate systems: Rectangular co-ordinates-Polar co-ordinates-In plane and in Space-Cylindrical polar co-ordinates-Spherical polar co-ordinates.

MODULE IV

Integral calculus: Application of definite integrals: Area, Volume, Arc length, Surface area. Improper Integrals-Beta function-Gamma function

Multiple integrals: Evaluation of double integrals-Change of order of integration. Evaluation of triple integrals-Change of Variables in integrals. Applications of multiple integrals Plane Area, Surface area &Volumes of solids

TEXT BOOKS:

1. Engineering mathematics -Vol1:S.S.Sastry, PHI publishers
2. Advanced Engineering Mathematics: Erwin Kreyzig, Wiley Eastern

REFERENCES:

1. Mathematical Techniques: Oxford University Press
2. Engineering Mathematics: T.Veerarajan, TMGH Publishers
3. Higher Engineering Mathematics: B.S.Grewal, Khanna Publishers

CE/CS/EB/EC/EE/EI/ME/IT/SE 102: ENGINEERING PHYSICS

Module I:
Interference of light – Michelson interferometer – Applications-Interference in thin films – Antireflection coatings – Interference filters – Fringes produced by air wedge – Testing of flat surfaces- Diffraction of light –Zone plate - Plane diffraction grating - Reflection and transmission gratings – Determination of wavelength of light – Dispersive and resolving powers - Polarization of light – Double refraction – Nicol's prism – Quarter and half wave plates – Elliptically and circularly polarized light – Optical activity – Specific rotation – Half-shade polarimeter – Applications of polarized light.

Module II:
Lasers and Holography – Properties of laser light – Coherence of light – Principles of laser action – Population inversion – Optical pumping – Metastable states – Conditions for laser action – Types of lasers – Helium-Neon, Ruby and Semiconductor lasers – Applications of lasers – Principles of holography – Recording and Reconstruction of holograms – Applications of holography- Fiber optics – Light transmission through optical fiber – Numerical aperture – Multi and single mode fibers – Step index and graded index fibers – Fiber drawing – Fiber optic communication (basic ideas) – Ultrasonics – Generation of ultrasonic waves – Applications of Ultrasound.

Module III:
Quantum mechanics – Heisenberg's uncertainty principle - Experimental illustrations – Quantum mechanical wave equation – Time independent Schrodinger equation – Physical significance of wave function – Properties of the wave function – Solution of Schrodinger equation - Atomic and nuclear physics – The Vector atom model – Quantization of orbital angular momentum – Electron spin - Magnetic moment of orbital electron – Pauli's exclusion principle– Zeeman effect – Stark effect – Raman effect. Nuclear physics – Nuclear forces – Properties of the nucleus - Nuclear reactions-Nuclear reaction cross section-Artificial radioactivity – Nuclear reactors – Nuclear fusion – Thermonuclear reactions-Controlled thermonuclear reactions.

Module IV:

X-rays – Production of X-rays – Origin of X-rays and X-ray spectra – Moseley's law – Properties of X-rays – Applications of X-rays – Diffraction of X-rays by crystals – Bragg's law – Crystallography – Unit cell – Seven crystal systems – Bravais space lattices - Packing factor – Lattice planes and Miller indices – Energy bands in solids – Conductors, semiconductors and insulators – Intrinsic and extrinsic semiconductors – Conductivity of semiconductors – Fermi level - Applications of semiconductors – p-n junctions – solar cells – Hall effect and its applications – Superconductivity – Superconducting transition – The Meissner effect – Type I and Type II superconductors – Isotope effect - High temperature superconductors – Josephson effect – SQUIDS – Applications of superconductors

Text and Reference Books :

1. *Jacob Philip – A text book of Engineering Physics, Educational Publishers and Distributors 2002*
2. *A.S. Vasudeva – Modern Engineering Physics, S. Chand & Co.*
3. *M.R. Sreenivasan – Physics for Engineers – New Age International*

CE/ CS/EB/EC/EE/EI/ME/IT/SE 103 ENGINEERING CHEMISTRY

Module I

Solid state chemistry: Fundamentals, Bonding in solids, Born-Haber cycle, Point defects, Methods to improve reactivity of solids, Free electron theory, Band theory, Fermi level in semiconductors, Molecular field theory of magnetic materials, Conventional and organic superconductors, High temperature superconductors, Liquid crystals, Applications. Solid surface characterisation: Electron spectroscopy for chemical analysis, Chemical shift, BET isotherm, Thermodynamics of adsorption.

Module II

Electrochemistry: Fundamentals, Electrode potentials, Types of electrodes, Salt bridge, emf measurement, Concentration cells, Acids and bases, Buffer solutions, pH measurements, Polarisation, Overvoltage. Power generation: Secondary cells, Fuel cells, Photovoltaic effect, Solar cells. Corrosion: Different forms of corrosion, Prevention of corrosion.

Chemical Kinetics: reaction rate, rate constant, rate law, reaction order, first order, second order, pseudo-first order reactions, integrated rate laws, half-life of a reaction and its relation to rate constant. Molecularity, simple unimolecular and bimolecular reactions. Arrhenius equation. Fast reactions – flash photolysis, flow techniques and relaxation methods.

Module III

Chemical Thermodynamics: Fundamentals, Molecular interpretation of internal energy, enthalpy and entropy, Heat of reaction, Kirchhof.s equation, Trouton.s rule, Entropy changes accompanying different processes, Nernst heat theorem, Third-law. Free energy: Dependence on pressure and temperature, Gibbs-Helmholtz equation, Free energy changes and equilibrium constant, Chemical potential, Fugacity, Thermodynamics of biochemical reactions.

Module IV

Engineering materials: Industrial polymers-polymerization techniques, structure-property relationships, polymer additives, polymer processing methods (extrusion, injection, compression, transfer and blow molding methods). Nanomaterials: definition, classification and applications. Nanometals and nanoceramics – examples and properties.

Lubricants: classification, functions and properties. Mechanism of lubrication.

Refractories: classification and properties. Portland cement, lime and plaster of Paris – manufacture, setting and hardening.

Chemistry of optical fibres, fullerenes and organoelectronic materials (introduction only).

Text Books

1. Peter Atkins and Julio de Paula *Elements of Physical Chemistry*, Oxford University Press, 2005

2. **Shashi Chawla** *A Text Book of Engineering Chemistry* (3rd edn.).; Dhanpat Rai & Co, New Delhi, 2003.

References

1. **Atkins, P.W.,** *Physical Chemistry*, Oxford University Press, UK, 1998
2. **Bhatnagar, M. S.,** *Textbook of Pure & Applied Physical Chemistry*, A. H. Wheeler & Co, Delhi, 1999.
3. **Geoffrey Ozin, Andre Arsenault** *Nanochemistry: A Chemical Approach to Nanomaterials*.; Royal Society of Chemistry, U.K. 2005.

CE/CS/EB/EC/EE/EI/IT/ME/SE 104 ENGINEERING MECHANICS

A) STATICS

MODULE I

Concurrent forces in a plane: Principles of statics. Composition and resolution of forces. Equilibrium of concurrent forces in a plane. Method of projection. Method of moments. Friction.

Parallel forces in a plane: Two parallel forces. General case of parallel forces in a plane. Centre of parallel forces and centre of gravity, Pappus theorems, centroids of composite plane figures and curves. Distributed forces in a plane.

MODULE II

Properties of areas: . Moment of inertia of a plane figure with respect to an axis in its plane. Polar moment of inertia. Product of inertia. Principal axes. Mass moment of inertia of material bodies.

General case of forces in a plane: Composition of forces in a plane. Equilibrium of forces in a plane. Plane trusses **-** Method of joints. Method of sections. Plane frames : Method of members.

Principle of virtual work: Equilibrium of ideal systems, stable and unstable equilibrium.

B) DYNAMICS

MODULE III

Rectilinear translation: Kinematics of rectilinear motion. Differential equation of rectilinear motion. Motion of a particle acted upon by a constant force, by a force as a function of time and by a force proportional to displacement. Simple harmonic motion. D'Alembert's principle. Momentum and impulse. Work and energy, ideal systems, conservation of energy. Impact.

MODULE IV

Curvilinear translation: Kinematics of curvilinear translation. Differential equations of motion. Motion of a projectile. D'Alembert's principle in curvilinear motion. Moment of momentum. Work and energy in curvilinear motion.

Rotation of a rigid body: Kinematics of rotation. Equation of motion of a rigid body rotating about a fixed axis. Rotation under the action of a constant moment. Compound pendulum. General case of moment proportional to the angle of rotation. D'Alemberts principle of rotation. Resultant inertia force in rotation. Principle of angular momentum in rotation. Energy equation for rotating bodies.

TEXT BOOK & REFERENCES :

1. Engineering Mechanics - Timoshenko and Young - McGraw Hill Book Company.
2. Mechanics for Engineers (Vol. 1- Statics and Vol.2 -Dynamics) - Beer F. P. & Johnston E. R. - Tata McGraw Hill.
3. Engineering Mechanics (Vol. 1- Statics and Vol.2 -Dynamics) - Merriam H. L. & Kraige L. G. - John Wiley and Sons.
4. Engineering mechanics- Biju N- Educational Publishers.

CE/CS/EB/EC/EE/EI/IT/ME/SE 105 ENGINEERING GRAPHICS

MODULE I

Introduction to engineering graphics. Drawing instruments and their use. familiarisation with current Indian Standard Code of Practice for general engineering drawing.
Scales- plain scale ,vernier scale, diagonal scale.
Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, archimedian spiral and logarithmic spiral- drawing tangents and normals to these curves.

MODULE II

Introduction to orthographic projections- plane of projection- principles of first angle and third angle projections, projection of points in different quadrants.
Orthographic projection of straight lines parallel to one plane and inclined to the other plane- straight lines inclined to both the planes- true length and inclination of lines with reference planes- traces of lines.
Projection of plane laminae of geometrical shapes in oblique positions.

MODULE III

Projection of polyhedra and solids of revolution- frustum, projection of solids with axis parallel to one plane and parallel or perpendicular to other plane- projection of solids with axis inclined to both the planes- projection of solids on auxiliary planes.
Section of solids by planes inclined to horizontal or vertical planes- true shape of sections.

MODULE IV

Development of surface of cubes, prisms, cylinders, pyramids and cones
Intersection of surfaces- methods of determining lines of intersection - intersection of prism in prism and cylinder in cylinder.

MODULE V

Introduction to isometric projection- isometric scales, isometric views- isometric projections of prisms, pyramids, cylinders, cones and spheres.
Introduction to perspective projections : visual ray method and vanishing point method- perspective of circles- perspective views of prisms and pyramids.

TEXT BOOKS & REFERENCES:

1. Engineering Graphics	P.I.Varghese & K.C. John, JET Publishers
2. Elementary engineering drawing	N.D.Bhat, Charotar publishing house
3. Geometric drawing,	P.S.Gill , B.D Kataria &sons Ludhiana
4. Engineering Graphics	P I Varghese, VIP Publishers.

CE/CS/EB/EC/EE/EI/IT/ME/SE 106 BASIC CIVIL AND MECHANICAL ENGINEERING

(A) CIVIL ENGINEERING

MODULE I

Materials: *Cement* - varieties and grade of cement and its uses. *Steel*- types of steel for reinforcement bars, steel structural sections. *Brick*- varieties and strength , tests on bricks. *Aggregates*- types & requirements of good aggregates. *Concrete*- grades of concrete as per IS code, water cement ratio, workability, mixing, batching, placing, compaction and curing.

Construction : *Foundation*- types of foundations- isolated footing, combined footing, raft, pile & well foundations,

MODULE II

Super structure : Brick masonry, English bond and Flemish bond , Stone masonry, Random rubble masonry. *Roofing*- Steel trusses, roofing for industrial buildings

Surveying: Principles, instruments, ranging and chaining of survey lines, errors in chaining, field work, field book, selection of survey stations, reconnaissance ,,

Levelling : Levelling instruments, different types, temporary adjustments, mean sea level, reduced level of point, booking of field notes, reduction of levels by height of collimation method.

Text Books & References :

1. Engineering materials : Rangawala
2. Building construction : Punmia
3. A Text book of building construction : N.K.R. Murthy
4. Fundamentals of Civil Engineering- : Roy M Thomas-Educational Publishers.
5. A Text book of building construction : Jha & Sinha
6. Surveying & Levelling : T P Kanetkar
7. Surveying & Levelling : Hussain

(B) MECHANICAL ENGINEERING

MODULE III

Thermodynamics: thermodynamic systems - open, closed and isolated systems, equilibrium state. of a system, property' and state, process, cycle, work, Zeroth law of thermodynamics-concept of temperature, temperature scales. First law - internal energy, enthalpy. Second law - Kelvin-Plank and Claussius statements, Carnot Cycle.

Refrigeration and Air conditioning: Vapour compression and vapour absorption refrigeration systems, summer and winter Air conditioning, Comfort and industrial Air conditioning.

Elementary ideas of simple reaction and impulse turbines, compounding of turbines.

MODULE IV

Internal Combustion Engines: working of two stroke and four stroke Petrol and Diesel engines, simple Carburettor, ignition system, fuel pump, fuel injector, cooling system, lubricating system.

Transmission of Power: Belt drives (open and closed), chain drives.

Metal fabrication: Welding - Arc, gas, resistance welding, Welding defects, Soldering, Brazing

Text Books & References:

1. Engineering Thermodynamics P.K.Nag
2. Engineering Thermodynamics D.B. Spalding & E.H.Cole
3. Engineering Thermodynamics Van Wylon
5. Thermodynamics J.P.Holman
6. Elements of Internal Combustion Engines Rogowsky, Tata McGraw Hill
7. Fundamentals of Internal Combustion Engines Gill, Smith & Ziurys, Oxford & IBH
8. Refrigeration and Air Conditioning, Stoecker Tata McGraw Hill

CE/CS/EB/EC/EE/ EI/IT/ME/SE 107 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(A) ELECTRICAL ENGINEERING

Module I

Basic principles of Electric circuits: Review of Ohms law - Definition of resistance, current, voltage and power - Series and parallel circuits- constant voltage source and constant current source.

Network Theorems: Kirchoff's laws- Network analysis by Maxwell's circulation currents - Thevenin's theorem - Superposition theorem -Norton's theorem - Simple illustrative problems on network theorems.

Review of electrostatics - Coulomb's Law- Electric field strength and Electric flux density- capacitance.

Module II

Review of electromagnetic induction -Faraday's Law- Lenz's Law - mutually induced emf. Magnetic circuits - magnetic field of a coil - Ampere turns calculation - magnetic flux - flux density - field strength.

Measuring instruments: Working principle of galvanometer, Ammeter, Voltmeter, watt meter & energy meter.

AC fundamentals: Generation of alternating voltage and current - equations of sinusoidal voltage and current - wave form, cycle frequency, time period, amplitude, phase difference, rms value, average value, power factor & form factor. Vector diagram - addition and subtraction of vectors- sine waves in phase and out of phase. AC circuits: RC, RL, RLC circuits-series and parallel - current, voltage and power relationships. Poly phase circuits: vector representation - phase sequence - star and delta connections.

(B) ELECTRONICS ENGINEERING

Module III

Passive components: Resistor – Capacitor - Inductor - Color coding. Transformer- different types, construction.

Semiconductors: Energy band diagram – intrinsic & extrinsic semi conductors, doping - PN junction – Diodes, Zener diodes- Characteristics - Application of diodes. Rectifiers- Half wave, full wave and Bridge rectifiers – Ripple factor and regulation.

Transistors: - PNP and NPN transistors - theory of operation - Transistor configurations - characteristics - comparison.

Special semiconductor devices - FET - SCR - LED - LCD – V-I characteristics, applications.

Module IV

Fundamentals of Instrumentation: Transducers - Definition - Classification – Active & passive - Transducer for position, pressure, velocity, vibration and temperature measurements.

CRO – principle of operation - measurement of amplitude, frequency and phase.

Fundamentals of Communication: Analog communication - concept of modulation, demodulation. Types: AM - FM -PM- Block diagram of general communication system -Basic concepts of digital communication - Block diagram.

Text Book:

1. Basic Electronics – Solid State – B. L. Theraja, S. Chand & Co.
2. Fundamentals of Electrical Engineering – Leonard S. Bobrow, Oxford University Press.

Further References:

1. Electrical Technology : Edward Hughes, Addison Wesley Publication
2. Electronic Devices & Circuits : G.K. Mithal & Ravi Mittal, Khanna Publishers

CE/CS/EB/EC/EE/E1/IT/ME/SE 108 COMPUTER PROGRAMMING

Module I

Introductionn to programming in C: Fundamental data types- integer, floating point, and enumerated data types, Expressions – arithmetic, relational and logic operators, Type conversion – simple and compound statement, Access to standard library, standard I/O-getchar, putchar, Formatted **I/O**, scanf, printf, error handling, line input and out put, control structures, selection statement, **IF, SWITCH, WHILE, DO WHILE, FOR, BREAK, COINTINUE, GOTO, RETURN** statements.

Module II

Functions: Declarations and functions, parameter passing mechanism, storage classes-scope, visibility, and life time of variables, AUTO, EXTERN, STATIC and REGISTER modifiers, Recursion.

Module III

Arrays : Single and multi dimensional arrays, sorting, selection sort, search-linear search and binary search, Structures and union.

Module IV

Pointers: Pointers and addresses, pointer arrays,,,,, function returning pointers, pointers to function, pointer arithmetic,. pointers to structures, array of structures, preprocessor directive, command line arguments, typedef.

Text Book & References:

1. Computer Fundamentals & Programming in C : Pradip Dey & Manas Ghosh (OXFORD)
2. Computer Fundamentals : Dr. Varghese Paul (EPD)
3. Programming in C : B.S. Gotfried (Schaum series, TMH)

CE/CS/EB/EC/EE/EI/ME/IT/SE 109 TECHNICAL COMMUNICATION AND SOCIAL SCIENCES

(**Module IV Environmental Studies : 1 hour per week**
Other modules : 2 hours per week)

PART - A TECHNICAL COMMUNICATION

Module I **(25 hours)**

Oral Communication: starting and ending a conversation; telling and asking people to do things; expressing opinions and ideas, decisions and intentions, offers and invitations, feelings, right and wrong, numbers and money.
Purpose and audience; dealing with customers and clients; face-to-face discussions; meetings and attending meetings; checking understanding; raising questions; giving and receiving feedback; using body language; leading and directing discussions; concluding discussions; using graphics in oral presentations

Reading Comprehension and reference skills: skimming and scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; comprehending graphics in technical writing.
Reading strategies; reading speed; reading between the lines for hidden meaning; interpreting graphics; using a dictionary; using an index; using a contents list to find information; choosing the right reference source.

Module II **(20 hours)**

Written Communication: note making and note taking; summarising; notes and memos; developing notes into text; organisation of ideas: cohesion and coherence; paragraph writing: ordering information in space and time; short essays: description and argument; comparison and contrast; illustration; using graphics in writing: tables and charts; diagrams and flow-charts; maps, plans and graphs.
Spelling rules and tips; writing a rough draft; editing and proof reading; writing the final draft; styling text; filling in complex forms; standard letters; CV; writing a report; writing leaflets and brochures; writing references; essay writing: expository writing; description of processes and products; classification; the instructional process; arguments and presentation of arguments; narrating events chronologically.

PART - B SOCIAL SCIENCES

Module III **(15 hours)**

Science, Technology and Ethics

Impact of science and technology on the development of modern civilization . The philosophy of modern science – scientific determinism – uncertainity principle. Relevance of scientific temper. Science and religion. Science and technology in developing nations. Technological advances of modern India. Intermediate and appropriate technology. Development of technical education in India.
Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professional ideals and virtues - Attributes of an ethical personality – Theories about right action – Self interest.
Responsibilities and Rights of engineers – Collegiality and Loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Professional rights.

Module IV

Environmental Studies : **(30 hours)**

Natural resources – issues related to the use and over exploitation of forest resources , water resources, mineral resources, food resources and energy resources – role of an individual in conservation of natural resources – equitable use of resources for sustainable life styles.
Concept of an ecosystem – structure and function – energy flow in the ecosystem – ecological succession - food chains, food webs and ecological pyramids – structure and functions of a forest ecosystem and an aquatic eco system.
Definition of biodiversity – genetic, species and ecosystem diversity – biogeographical classification of India – Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
Causes, effects and control measures of air pollution, water pollution, soil pollution , noise pollution, marine pollution, thermal pollution and nuclear hazards – Causes, effects and control measures of urban and industrial solid wastes –Role of an individual in prevention of pollution - An overview of the various environmental legislations in India – Issues involved in enforcement of environmental legislation.
The concept of sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, water shed management – Resettlement and rehabilitation of people ; its problems and concerns - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust – Population growth and problems of population explosion – Environmental ethics : issues and possible solutions..

Text Books:

Meenakshi Raman and Sangeetha Sharma *Technical Communication : Principles and Practice,*
Oxford University Press, 2004

Rajagopalan. R *Environmental Studies : From Crisis to Cure*, Oxford
University Press, 2005

Jayashree Suresh and B.S. Raghavan *Professional Ethics*, S. Chand & Company Ltd, 2005.

WC Dampier *History of Science*, Cambridge University Press.

References:

Adrian Doff & **Christopher Jones,** *Language in Use* . Upper intermediate, self-study workbook & classroom book, Cambridge University Press,2000.

Krishna Mohan & **Meenakshi Raman**, *Effective English Communication* ,Tata Mc-Graw Hill,2000.

Edmund D. Seebaur & Robert L. Barry *Fundamentals of Ethics for Scientists and Engineers,* Oxford University Press, 2001

Krishna Mohan & **Meera Banerji**, *Developing Communication Skills* Mac Millan India Ltd,2000.

Rajendra Pal & JS Korlahalli *Essentials of business communication*, S. Chand & Company Ltd

Sarah Freeman, *Study Strategies*, Orient Longman, 1978.

Meenambal T , Uma R M and K Murali *Principles of Environmental Science and Engineering*, S. Chand & Company Ltd, 2005

University Examination pattern

The question paper will have two parts. Part A (Technical Communication) will cover Modules I, II and will have a weightage of 50 marks. Part B (Social Sciences) will cover Module III

and Module IV (Environmental Studies) and will have a weightage of 50 marks. Part A and Part B will have to be answered in separate answer books.

Part A

University examination pattern

Q I - 4 short type questions of 5 marks, 2 each from module I and II
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one

Part B

University examination pattern

Q I - 5 short type questions of 4 marks, 2 from module III and 3 from module IV
Q II - 2 questions A and B of 10 marks from module III with choice to answer any one
Q III - 2 questions A and B of 20 marks from module IV with choice to answer any one

CE/CS/EB/EC/EE/EI/ME/IT/SE 110
COMPUTER PROGRAMMING LABORATORY

1. Study of OS commands. General introduction to application packages.
2. Programming using C control structures & pointers.
3. Searching & sorting
4. Creation and use of databases in a suitable database package
5. Programming exercises in C.

CE/CS/EB/EC/EE/EI/ME/IT/SE 111

ELECTRICAL AND MECHANICALWORKSHOPS

ELECTRICAL WORKSHOP

1. One lamp controlled by one switch
2. Series and parallel connections of lamps.
3. Stair case wiring.
4. Hospital Wiring.
5. Godown wiring.
6. Fluroscent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
9. Transformer winding.
10. Soldering practice.
11. Familiarisation of CRO.

MECHANICAL WORK SHOP

1) Fitting Shop.
2) Sheet Metal Shop
3) Foundry Shop
4) Welding Shop
5) Carpentry Shop

(Preliminary exercises for beginners in all shops. Specific models may be designed by the teachers.)

Introduction to the use of concrete mix.

CE/CS / EB/ EC /EE/ EI/IT/ ME/SE 301 ENGINEERING MATHEMATICS II

Module I

Matrices and Vector spaces: Rank of matrix, Echelon and normal form, Solutions of linear systems of algebraic equations, Eigen values and Eigen vectors, Cayley- Hamilton theorem (no proof).

Vector Spaces- Subspaces, -Linear Independence of vectors-Linear span-Dimension and Basis. Linear transformations.

Module II

Fourier series and Fourier integrals: Fourier series of Periodic functions-Euler formulae for Fourier coefficients- functions having period 2π, arbitrary period- even and odd functions-half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

Module III

Laplace transforms: Linearity property, transforms of elementary functions, Laplace transforms of derivatives and integrals, differentiation and integration of transforms, convolution theorem (no proof), use of Laplace transforms in the solution of initial value problems, unit step function, impulse function - transform of step functions, transforms of periodic functions.

Module IV

Vector calculus: Scalar and Vector point functions-Gradient and directional derivative of a scalar point functions. - Divergence and Curl of a vector point functions- their physical meanings. Evaluation of line integral, surface integral and volume integrals, Gauss's divergence theorem, Stoke's theorem (No Proof of these theorem), conservative force fields, scalar potential.

Text books:

1. R.K.Jain, S.R.K.Iyengar, *Advanced Engineering Mathematics*, Narosa Publishers.
2. C.R.Wilie & L.C.Barrett, *Advanced Engineering Mathematics*, McGraw Hill Publishers

References:

1. Larry C Andrews, Ronald C Philips, *Mathematical Techniques For Engineers & Scientists*, Phi Publishers
2. M.C.Potter, J.L.Goldberg, *Advanced Engineering Mathematics*, Oxford University Press
3. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publishers

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE302 FLUID MECHANICS & HEAT ENGINES

Module I

Fluids and their properties: Fluids, shear stress in a moving fluid, viscosity, Newtonian and non-Newtonian fluids, viscosity in liquids and gases. Fluid statics: pressure, variation of pressure in a static fluid, absolute and gauge pressure, measurement of gauge pressure.
Kinematics of fluid flow: Eulerian and Langragain approaches, classification of fluid flow as steady and unsteady flow, uniform and non uniform flow, laminar and turbulent flow, Path line, stream line, streak line and stream tube, one, two, and three dimensional flow, velocity and accelerations in steady and unsteady flow. **Basic Hydrodynamics:** Ideal fluids, equations of continuity in the differential form, rotational and irrotational flow, circulation and vorticity, Stream function, Velocity potential, one dimensional flow along a stream line, Bernoulli's equation and its limitations, measurement of velocity, Pitot tube and Pitot-static tube, venturi meter, orifice meter, flow nozzles, notches and weirs.

Module II

Steady flow of incompressible fluids in pipes: Laminar and turbulent flows, critical Reynolds number, hydraulic radius, general equation for friction, laminar flow in circular pipes, Darcy- Weisbach equation, friction factor, equivalent pipes, minor losses in pipes, Development of boundary layer. **Dimensional Analysis & Similitude:** Rayleigh's method, Buckingharm's Pi theorem, nondimensional parameters in fluid mechanics and machinery – principles of similitude – geometric, kinematic and dynamics similarities – model studies. Physical meaning of important dimensional groups of fluid mechanics and their practical use.

Module III

Dynamic action of fluid: Momentum equation applied to a control volume, impact of jets, flow of an incompressible fluid over fixed and moving vanes, work done and efficiency.
Hydraulic turbines: velocity triangles, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine, their constructional features and performance characteristics – non dimensional parameters for comparative study of turbine performance, theory of draft tubes, speed regulation of turbines, selection of type and speed of turbines.

Module IV

Pumping machinery: general features of positive displacement and rotodynamic pumps, cetrifugal pumps, classification, principle of working, velocity diagrams, losses in pumps, circulatory flow, multistage pumps, propeller pumps, priming, cavitation and its significance.
Reciprocating pumps: Acceleration head, effect of friction, use of air vessels, efficiencies, pump characteristics.

References:

Douglas, Gasiorek, and Swaffield: Fluid mechanics – Pitman
Daugherty & Franzini: Fluid mechanics with Engg.Applications Mc Graw Hill
Dr. Jagdish Lal: Hydraulic mechanics, Metropolitan book Co. Delhi-6
N.S Govinda Rao: Fluid flow mechanics - Tata Mc Graw Hill.
F.M White: Fluid Mechanics.
Vallentine: Applied hydrodynamics – Butter worths – London.
Massery : Fluid Mechanics – ELBS
K.L Kumar: Engineering fluid mechanics – Eurasia publishing house, New Delhi.
Herbert Addison: A Treatise on applied hydraulics.
A.J Stepanof : Centrifugal and axial flow pumps, Wiley, Newyork.
D.G Shepherd : Principles of turbo machinery – Mac Millan publishing Co. Inc.
Som & Biswas : Introduction to fluid Mechanics & Machinery (TMH)
Agarwal: Fluid mechanics & Machinery, TMH.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CE/EE 303 STRENGTH OF MATERIALS

Module I

Tension, Compression and Shear : Normal stresses and strains – Mechanical properties of mild steel – Elasticity, plasticity and creep – Liner elasticity, Hooke's law and Poisson' s ratio – Shear stress and shear strain – Allowable stresses and allowable loads – design for axial loads and direct shear

Axially loaded Members : Changes in lengths of axially loaded members – Changes in lengths of nonuniform bars – Thermal effects, misfits and prestrains – stress on inclined sections – strain energy

Module II

Torsion : Torsional deformation of circular bar – Circular bars of linearly elastic materials – nonuniform torsion – stresses and strains in pure shear – relationship between modulus of elasticity, bulk modulus and rigidity modulus – transmission of power by circular shafts – Circular shafts fixed on both ends – strain energy in torsion and pure shear

Shear forces and bending moments: Types of beams, loads and reactions – shear forces and bending moments – relationships between loads, shear forces and bending moments – Shear force and bending moment diagrams

Module III

Stresses in beams : Pure bending and non uniform bending – Curvature of a beam – Longitudinal strains in a beam – Normal stresses in beams (linearly elastic materials) – Design of beams for bending stresses – Nonprismatic beams – Shear stresses in beams of rectangular cross section – Shear stresses in beams of circular cross section – Shear stresses in webs of beams with flanges

Analysis of stress and strain : Plane stress – Principal stresses and maximum shear stresses – Mohr's circle for Plane stress – Hooke's law for plane stress – Maximum stresses in beams – Plane strain

Module IV

Deflection of determinate Beams : Differential equation of deflection profile – Deflection by integration of the bending moment equations – Deflection by integration of the shear-force and load equation – Method of superposition – Moment area method

Columns : Buckling and stability – Columns with pinned ends – Columns with other support conditions – Columns with eccentric axial loads – The secant formula for columns

Text Book

Gere J M. – Mechanics of Materials, Brooks/Cole Thomson Learning.

Reference

Wang C.K – Intermediate Structural Analysis, McGraw Hill International Edition

Pytel.A& Kiusalaas J. – Mechanics of Materials-, Brooks/Cole Thomson Learning

Popov E.P- Engineering Mechanics of Solids, Printice-Hall of India Limited, New Delhi,

Timoshenko S.P. and Young D.H - Elements of strength of materials, East-West Press Private Limited New Delhi, India.

Nash – Strength of Materials – Shausm's OUTlines, McGraw Hill

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 304 ELECTRIC CIRCUIT THEORY

Module I

Review of network theorem – superposition, reciprocity, Thevenin's, norton's, maximum power transfer theorem mesh and node analysis by inspection – network topology – definition of graph, tree, incidence matrix, curset, tie set, application of graph theoretic methods to formulation of network equation – current variable and voltage variable methods.

Module II

Coupled circuit – self and mutual inductance analysis of coupled coils – dot rule – conductively coupled equivalent circuits – coupling coefficient – linear transformer – ideal transformer.
Two port networks - characterization in terms of impedance, admittance, hybrid and transmission parameters – inter relationship among parameter sets – reciprocal and symmetrical two port networks – inter connection of two port network – I and II equivalent of a two port network – image impedance – characteristic impedance and propagation constant of a symmetrical two port network.

Module III

Polyphase systems – balanced and unbalanced loads – unbalanced three wire and four wire star connected load – displacement neutral method – power measurement using wattmeter.
Circuit transients – direct current transients - RL, RC, RLC transients – alternating current transients – application of laplace transform for transients analysis.

Module IV

Fourier method of waveform analysis – frequency spectrum of periodic signals – trigonometric fourier series – exponential fourier series.
Fourier transform and inverse fourier transform – properties of fourier transforms – continuous amplitude and phase spectra.
Filters – analysis of constant K and derived filters.
Network synthesis – foster and cauer forms.

Text Book

1. *Theory & problems of electric circuit, Schaum's outline series* – Joseph. A.Edminister, Tata McGraw Hill edition.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 305 ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

Module I

General Principles of Measurements, Standards: Absolute and Working Standards, Calibration of Meters, Qualities of Measurements, Characteristics, Errors in Measurement and its Analysis, Direct Deflecting Instruments. Moving Coil, Moving Iron, Dynamo Meter, Induction, Thermal, Electrostatic and Rectifier Type, Shunts and Multipliers, Various Types of Galvanometers.

Module II

Measurement of Current, Voltage and Resistance, Measurement of Insulation Resistance, Earth Resistance, Earth Tester; Measurement of Power and Energy, Dynamometer Type Wattmeter, Error and Compensation, Ampere Hour Meter, Single and Three Phase Energy Meters (Induction Type), Calibration, Trivector Meter, Frequency Meters, Power Factor Meters, Current Transformers and Potential Transformers.

Module III

Null Deflection Method – Measurement of Resistance; Current, Voltage and Power – Direct Current Potentiometer-Wheatstone Bridge-Kevin Double Bridge-Carry Foster Slide Wire Bridge-Bridge Current Limitations-Localization of Cable Fault by Murray and Varley Loop Tests-A.C Potentiometers-Various A.C Bridges and Measurement of Inductance & Capacitance; Magnetic Measurements: Classification-Measurement of Flux and Permeability-Hibbert's Magnetic Standard –Flux Meter, Hall Effect Gauss meter, Ballistic Galvanometer, Calibration-Vibration Galvanometer-B.H. Curve and Permeability and Measurement on bar and ring specimens-Hysteresis Measurement- Core Loss Measurement with Lloyd Fishes square

Module IV

Illumination: Laws of Illumination- Polar Curves- Photometry- Luminous Efficiency- Measurement of Illumination of Different Light Sources- Illumination of Surfaces- Levels of Illumination; Digital Measurements and Meters; Oscilloscope- Basic Principle of Signal Display- Triggered Sweep CRO- Trigger Pulse Circuit- Delay Line in Triggered Sweep- Sync- Selector for continuous Sweep CRO- Dual Beam CRO- Dual Trace Oscilloscope-Applications.

Reference:

1. A.K Sawhney - *A course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai & Sons.
2. Golding E.W - *Electrical Measurements & Measuring Instruments*, Wheeler Pub.
3. Cooper W.D - *Modern Electronics Instrumentation*, Prentice Hall of India.
4. Stout M.B - *Basic Electrical Measurements*, Prentice Hall.
5. Oliver & Cage - *Electronic Measurements & Instrumentation*, McGraw Hill.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EB/EE 306 ELECTRONIC DEVICES & CIRCUITS

Module 1

DC power supplies - power transformers - rectification - half wave , full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers - dual power supplies - zener and avalanche diodes - simple and series voltage regulator. *Special semiconductor devices:* Principles and operation of photodiodes, PIN diodes, phototransistors, LED, UJT. MOSFET**-** basic principles & characteristics.

Module 2

Small Signal amplifiers: Bipolar junction transistor – configurations, characteristics - current amplification factors - relations between alpha & beta – comparison. *BJT amplifiers*: Biasing techniques of BJT- stabilization of operating point - h-parameters - CE RC coupled amplifier - concept of load lines- frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth.

FET Amplifiers: Principle of operation, characteristics, Common source amplifier-design, frequency response-applications

Module 3

Power amplifier - classification - class A, B, AB and C power amplifiers-tuned amplifier-pushpull and complementary symmetry power amplifier –Harmonic distortion– Heat sinks.

Feed-back amplifiers: concept of Negative and positive feedback – Bark Hausen criteria -low frequency sinusoidal oscillators

High frequency oscillators – types- LC, Crystal oscillators –circuit diagram-description-applications

Module 4

*Pulse Circuits***:-**Different types Pulse circuits - pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits –applications. Clipping and clamping circuits using diodes - *Transistor as a switch*– simple sweep circuits-bootstrap sweep.

Multivibrators-astable, monostable and bistable ciruits using BJTs-applications

Text book:

Boylestead & Neshelsky: ,"Electronic Devices & Circuit Theory", PHI2003
Millman & Halkias, "Electronic Devices & Circuits", TMH, New Delhi.1996
Taub & Schilling, Pulse, Digital and Switching ciruits, TMH, New Delhi

References:

Bapat Y N, "Electronic Devices & Circuits", Tata McGraw Hill, New Delhi.1995
Allan Mottorshed, " Electronic Devices & Circuits", PHI, New Delhi.
Schilling & Belove "Electronic Circuits, Discrete & Integrated", TMH, New Delhi 1989
Theodore F.Bogart: "Electronic Devices & Circuits" Universal Book Stall, New Delhi 1992

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EE 307 ELETRONIC CIRCUITS LAB

1. Study of Multimeter, Signal generators, CRO etc. and measurement of electrical quantities
2. Testing of Passive and Active components - Resistors, Capacitors, inductors, Transformers, diodes, Transistors, etc.
3. Characteristics of Active devices
4. Rectifying circuits
   i) HW rectifier
   ii) FW rectifier
   iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
   (Measurement of ripple factor, maximum ratings of the devices)

Differentiating circuit and integrating circuit.

6. Clipping & Clamping circuits.
7. Amplifying circuits Simple common emitter amplifier configuration - gain and bandwidth.
8. Oscillators –
9. Multivibrators – A stable only.
10. Circuits using OP- Amps

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 308 BASIC ELECTRICAL ENGINEERING LAB

1. Determination of the voltage-current characteristics of linear resistance and an incandescent lamp
2. Measurement of linear resistance using voltmeter and ammeter.
3. Potential divider connection of rheostat and dependence of output voltage upon the value of the load resistance.
4. Study of PMMC and MI voltmeters and ammeters, dynamometer type wattmeter, clip on ammeter, standard symbols on the dials of the meters
5. Verification of Kirchoff's laws using rheostats.
6. Verification of superposition theorem in a resistive circuit with two given d.c. sources.
7. Verification of Thevenin's theorem in d.c. circuits.
8. Verification of generalized Reciprocity theorem in a d.c. circuit.
9. RLC series parallel circuit – Measurement of current in various branches and verification by calculation – drawing Phasor diagram.
10. Study of voltage – current relationship of series circuit with given RLC elements and condition for series resonance.
11. Determination of fusing time versus current characteristics for two specimens – Fusing factor – study of various types of fuses.
12. Single-phase power measurement using a wattmeter – determination of thermal efficiency of a kettle.
13. Measurement of power in three-phase circuits.
    a) Single wattmeter method.
    b) Two wattmeter method.

Student shall present his/her fair record, notebook duly certified by the Head of the Department, to the examiners at the time of University practical examination.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

CE/CS / EB/ EC /EE/ EI/IT/ ME/SE 401 ENGINEERING MATHEMATICS III

Module I

Complex Analytic functions and conformal mapping: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy - Riemann equations, Elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.
Conformal mapping: Linear fractional transformations, mapping by elementary functions like Z^2, e^z, sin z, cos z, sin hz, and Cos hz, Z+1/Z.

Module II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III

Partial differential equations: Formation of partial differential equations. Solutions of equations of the form F(p, q) = 0, F(x, p, q)=0, F(y, p, q)=0, F(z, p, q)=0, F1(x, p) = F2(y, q), Lagrange's form Pp + Qq = R. Linear homogeneous partial differential equations with constant coefficients.

Module IV

Vibrating string : one dimensional wave equation, D' Alembert's solution, solution by the method of separation of variables, One dimensional heat equation, solution of the equation by the method of separation of variables.
Solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

Text Books:

1. R.K.Jain, S.R.K.Iyengar, *Advanced Engineering Mathematics*, Narosa Publishers, 2nd ed.
2. C.R.Wilie & L.C.Barrett ,*Advanced Engineering Mathematics*, Mc Graw Hill,6th ed.

References:

1. Ervin Kreyszig, *Advanced Engineering Mathematics*, Wiley Eastern,9th ed.
2. Churchill R.V, *Complex Variables & Applications*, Mc Graw Hill Publishers,5th ed.
3. M.C.Potter, J. L. Goldberg, *Advanced Engineering Mathematics*, Oxford University Press,3rd ed.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 402 LOGIC DESIGN

Module I

Number System and binary codes: Binary, Octal and Hexadecimal number systems – binary arithmetic, binary codes, excess-3 code, Gray code error detection and correction – Boolean algebra – minimisation of Boolean functions using Karnaugh map and Quine-Mclusky methods – formation of switching functions from word statements, realisation using NAND, NOR & XOR gates – combinational circuits – multiplexer – demultiplexer, decoder, encoder.

.

Module II

Arithmetic circuits: Half adder, full adder, subtractor, serial and parallel addition – carry look ahead adder – binary multiplication – multivibrators – monostable and astable multivibrators using discrete gates.

Module III

Sequential circuits: flip-flops – RS, JK, T & D flip-flops, shift registers – counters – design -asynchronous and synchronous counters, up-down counters, Modulo counter, ring counter, Johnson counter – sequence generators – analysis of sequential circuits – state table and diagrams
Memories – ROM, RAM, EPROM, EEPROM Programmable logic array, devices – basic ideas – PLD architecture – PAL and PLA – programmable examples with software tools.

Module IV

Logic families: RTL, DTL, TTL, ECL, and CMOS – tristate logic – specification and transfer characteristics of basic TTL interfaces, - standard logic levels – current and voltage parameters – fan in and fan out – propagation delay, integrated circuits modules, noise consideration – interfacing of CMOS to TTL and interfacing of TTL to CMOS.

TextBook:-
1) Taub & Schilling - *Digital Integrated Electronics*

Reference:
1) Samuel C Lee - *Digital Circuits and Logic Design*
2) A P Malvino - *Digital Computer Electronics*
3) Morris & Miller - *Design with TTL Integrated Circuits*

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 403 ELECTRICAL MACHINES I

Module I

DC generators: Principle of DC generators, constructional details, field, armature and commutator or magnetic circuits, field flux distribution. Armature windings – pole pitch, coil span, winding pitch and commutator pitch. Simplex lap and wave windings, parallel paths, equalizer ring connections, dummy coils – methods of setting brushes in d.c machines. Methods of excitation – separately excited, shunt, series and compound machines. Induced e.m.f – e.m.f. equations. Armature m.m.f. – Magnitude and direction, armature reaction – air gap flux distribution under load conditions, effect of saturation, demagnetizing and cross-magnetizing armature m.m.f. – variation with brush position – compensating winding connections.

Module II

Commutator: Time of commutation, e.m.f. In the coil undergoing commutation, reactance e.m.f. – effect of brush shift, interpoles – polarity and winding connections. Type of d.c. generators – characteristics – open circuit characteristics, condition for self-excitation, critical resistance, critical speed. Load characteristics, effect of compounding. Parallel operation – parallel operation of shunt series and compound generations, equalizer connections.

Module III

DC Motors: Principles of operation, back e.m.f, production of torque, torque equation, developed and shaft torque, performance characteristics of shunt, series and compound motors, applications of various types of DC motors. Starting – need of the starter, face plate starters – three point and four point starters, calculation of resistance elements for shunt meter starter, Speed control – field control, armature control – Ward Leonard speed control. Testing of d.c. machines – losses and efficiency, separation of losses – Swinburne's test, Hopkinson's test, Fields Test, retardation test.

Module IV

Transformers: Single-phase transformer - constructional details – core, winding, insulation and brushing. Principles of operation, turns ratio, emf equation. Operation on load - magnetizing and core loss components – phasor diagram – equivalent circuit. Regulation – losses and efficiency.

Testing of transformers: DC test, SC test, Sumpner's back to back test, separation of losses, three phase connections – star and delta connections using single phase transformers. Three phase transformers – oscillating, neutral, tertiary winding, Scott connection –open delta connection – six phase connections. Parallel operation, load sharing, distribution transformers – all day efficiency.

References:

Clayton A.E. & Hancock N.N.- *Performance and Design of DC machines*, ELBS/CBS Publishers, Delhi, 1990

Theraja B.L.- *A text book of Electrical Technology Vol II*, S. Chand & Co.,

Bhimbra P.S. - *Electrical Machinery*, Khanna Publishers, New Delhi

M.G. Say- *Performance and Design of AC machines*, ELBS & Pitman, Third Edition, 1980.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 404 LINEAR SYSTEMS ANALYSIS

Module I

Systems Concepts and Modelling of electrical systems: Classification of systems, static dynamic, linear, non-linear, time varying, time invariant, distributed, lumped etc. Superposition principle, Modelling of electrical systems, dynamic equations using Krichhoff's laws. Transfer functions-block diagrams and signal flow graphs.

Module II

Modelling of non-electrical systems: Translational and rotational systems, force voltage and force-current analogy- friction spring inertia-pneumatic hydraulic and thermal systems. Dynamic equations and transfer functions-comparison of different systems.

Module III

Time domain analysis for linear systems: Response to standard inputs, impulse response-step ramp and acceleration inputs-time domain performance measures-under damped and over damped systems, error constants.

Module IV

State space models for linear systems: Concepts, state space, linear systems in state space, state models from transfer functions state transition matrix time response from state model zero state and zero input response concept of stability. BIBO stability, Routh's Hurwitz criterion. Lyapunov's stability-asymptotic. Stability theorems applied to linear systems only.

Reference:

1. David.K.Cheng - *Analysis of Linear Systems*, Addison Wesley, 1977
2. Burton.T.D - *Introduction to Dynamic Systems*, McGraw Hill, 1994.
3. C.T Chen - *Linear Systems Theory and Design*, 1999.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EC/EE 405 ANALOG COMMUNICATION

Module I.

Introduction–communication process, source of information, communication channels; Modulation – need, band width requirements – electromagnetic spectrum. Amplitude modulation – principles – visual concepts, modulation factor and percentage of modulation, mathematical relationship, component phasors, frequency spectrum, band selection. Amplitude modulators – ISB modulators – VSB modulation. AM transmitters – low level, high level – SSB systems – comparisons, mathematical analysis, SSB generation –SSB transmitters – filter method, phase shift method, third method. AM receivers – TRF receivers, Super heterodyne receiver, Double Super heterodyne receiver – SSB receiver – BFO, envelope detection, multi-channel Pilot carrier.

Module II.

Angle Modulation – mathematical analysis, principles, waveforms, frequency deviation, frequency analysis, bandwidth requirement, phasor representation–pre-emphasis, de-emphasis. FM modulators – direct, indirect, Phase modulators – direct. FM transmitters – direct FM, indirect FM; FM receivers-block diagram– demodulators – Tuned circuit frequency discriminators, slope detector, balanced slope detector, Foster-Seeley discriminators, ratio detectors – FM noise suppression; FM stereo broadcasting-stereo transmitter, stereo receiver (block level treatment only).

Module III.

Noise – external, internal – noise calculations, multiple noise sources, equivalent noise band width – Noise figure – Effective noise temperature, noise figure in terms of available gain – Noise in AM, angle modulation, pulse modulation – Performance of Communication systems – noise representation- Comparison of coded and uncoded systems - Characteristics of receivers – sensitivity, selectivity, double spotting, SNR – AGC circuitry – Performance of communication receivers – Comparison study of AM, FM and PM.

Module IV.

Telephony –Simple telephone communication, classification of switching systems, Basics of a switching system; Switches & Multiplexers, DTMF & Pulse signaling, Electronic switching – stored program control, centralized and distributed SPC, enhanced services, Time division, space division & combination switching, Signaling techniques; Traffic Engineering – Network traffic, load and parameters, grade of service, blocking probability, traffic congestion.

Text Books:

George Kennedy, *Electronic communication systems*, McGraw Hill ,4th ed.
Thiagarajan-Viswanathan, *Telecommunication Switching Systems and Networks*, PHI Ltd, 2001

References:

Simon Haykin, *Communication Systems*, John Wiley & Sons, 2004.
Robert J Schoenbeck, *Electronic Communications Modulation & Transmission*, PHI Ltd, 2nd Ed.
Wayne Tomasi, *Electronic Communications Systems (Fundamentals through Advanced)*, Pearson Education 5th Ed.
B. P. Lathi, *Communication Systems*, B.S Publication, 2001
Taub & Schilling, *Principles of Communication Systems*, Tata McGraw Hill, 1991
Roddy & Coolen, *Electronic Communications*, Pearson Education/ Ltd, 4th Ed.
D. N. Krishnakumar, *Telecommunication & Switching*, Sanguine Publishers, 2006

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EC/EB/EI/EE/ 406 INDUSTRIAL & POWER ELETRONICS

Module I.

Power transistors - Design of high power amplifier – switching transistors - Parallel operation of transistor - Power MOSFET - Operating principles - Structure and characteristics. Thyristors – Classification & Constructional Details. SCR - Working principle - turn on, turn off and V - I characteristics - gate characteristics, and rating: Series and parallel operation of SCR - TRIAC - characteristics, modes of operation, Trigger circuits - magnetic & solid state , half- wave and full-wave operation .

Module II.

Single phase controlled rectifiers - half-wave, full-wave, half-controlled and fully controlled - typical waveforms with R, RL, RL with diode and RL with voltage source - voltage and current equation for half-wave controlled rectifier. Three phase half-wave and full-wave controlled rectifier with R load, waveforms. DC motor speed control - various schemes – multi quardrant operation - simple circuits for speed control of series, PM and separately excited motors.

Module III.

Commutation schemes - (different classes) waveforms - single-phase invertors - series, parallel and bridge -PWM invertor - square wave and sin wave output. Chopper circuits using SCR transistor (detailed analysis not required) - Jones Chopper. A.C Motor speed control - various schemes - electronic control of speed of induction motors and synchronous motors.

Module IV.

Static switches: dc & ac switches-1φ and 3φ switches-design of static switches-Solid state relays.
Switching regulators - Basic concepts, analysis and design of Buck, Boost, Buck-Boost and derived converters . UPS - Characteristics - Configuration – Application. Batteries: Characteristics and selection-charging circuits.
Thyristor protection - over current, over voltage, di/dt, dv/dt, gate protection.
Industrial applications: Timer circuits - Flasher circuits-Electronic ballast, dielectric heating, induction heating.

Text Book:

1. Muhammed H. Rashid, *Power Electronics – Circuits, Devices and Applications*, PHI Ltd, 3rd ed.

References:-

1..*Power Electronics*, IMPACT Learning Material Series, Indian Society for Technical Education.
J. Michael Jacob, *Power Electronics: Principles & Applications*, Thomson Learning, New Delhi,
2. B. K. Bose, *Modern Power Electronics And AC Drives*, Pearson Education/ Prentice-Hall
3. Biswanath Paul, *Industrial Electronics and Control,* Prentice Hall of India, New Delhi, 2002
4. D W Hart, *Introduction to Power Electronics*, Pearson Education,1997
5. P C Sen, *Power Electronics*, Tata Mc Graw Hill, 2007
6. Singh & Khanchandani , *Power Electronics*, Tata Mc Graw Hill, 2nd ed.
7. Asghar M syed , *Power Electronics*, Prentice Hall of India, 2003
8. Hays , *The art of Electronics*, Cambridge University Press,1989

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EB/EI/EC/EE 407 DIGITAL ELECTRONICS LAB

1. Half adder and full adder using NAND gates.
2. Code converters - Binary to Gray and gray to Binary using mode control
3. Binary addition and subtraction (a) 1's complement (b) 2's complement (using 7483)
4. BCD adder using 7483.
5. Study of MUX, DeMUX &Decoder Circuits and ICs
6. Set up R-S & JK flip flops using NAND Gates
7. Asynchronous UP / DOWN counter using JK Flip flops
8. Design and realization of sequence generators.
9. Study of shift registers and Implementation of Johnson and Ring counter using it.
10. Study of IC counters 7490, 7492, 7493 and 74192 or the CMOS equivalent.
11. Astable and monostable multi- vibrators using TTL gates.
12. Transfer characteristics and specifications of TTL gates

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 408 ELECTRICAL MEASUREMENTS LAB

Measurement of resistance using Wheatston's bridge
Measurement of resistance using Kelvin's double bridge
Measurement of self and mutual inductance of coupled coils
Measurement of KVAR in 3-phase circuits by single and two wattmeter method.
Calibration of ammeter using slide wire potentiometer
Calibration of Voltmeter using slide wire potentiometer
Measurement of internal resistance of battery using vernier potentiometer
Measurement of resistance of earth electrode using earth megger.
Calibration of wattmeter using vernier potentiometer
Determination of B-H curve
Determination of Hysterisis loop-tracing the loop using CRO
Calibration of single phase energy meter by direct and phantom loading
Calibration of single-phase energy meter at 0.5 & 0.866 p.f. without using phase shifting transformer.
Calibration of 3-phase energy meter.
Adjustments in energy meter using rotating sub- standard.

Student shall present his/her fair record, notebook duly certified by the Head of the Department, to the examiners at the time of University Practical examination.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

CE/CS / EB/ EC /EE/ EI/IT/ ME/SE 501 ENGINEERING MATHEMATICS- IV

Module I

Probability distributions: random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution , normal distribution.
Curve fitting: method of least squares, correlation and regression, lines of regression.

Module II

Sampling distributions: population and samples, the sampling distribution of the mean unknown),σ known), the sampling distribution of the mean (σ(the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means. The estimation of variances: Hypotheses concerning one variance - Hypotheses concerning two variances.

Module III

Finite difference Operators:∇, Δ, E, δ, μ , $x^{(n)}$

Newton's Forward and Backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial. Lagrange interpolation polynomial, divided differences, Newton's divided differences interpolation polynomial
Numerical differentiation: Formulae for derivatives in the case of equally spaced points.
Numerical integration: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module IV Numerical solution of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4th order formula,
Numerical solution of boundary value problems: Methods of finite differences, finite differences methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

Text Books:
1.Irvrin Miller & Freind, *Probability and Statistics for Engineers,* Prentice-Hall India Ltd, 6th ed.
2. S. S. Sastry, *Numerical Methods*, Prentice-Hall India Ltd, 4th ed.
References:

1.P. Kandaswamy K.Thilagavathy, K.Gunavathy , *Numerical Methods*, S. Chand & Co., 2005
2. A. Papoulis, *Probability, Random Variables And Stochastic Processes*, McGraw Hill, 4th ed.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 502ELECTRICAL MACHINES II

Module I

Alternators- constructional features of high speed cylindrical rotor and low speed salient pole machines, synchronous speed AC windings - different types (detailed drawing not required) emf equation- distribution factor- coil span factor- field mmf and gap flux density distribution – harmonics in induced emf - remedial measures - mmf of AC windings- space harmonics- revolving magnetic field.

Module II

Theory of cylindrical rotor machines- armature reaction- synchronous impedance- voltage regulation-determination of regulation by mmf, emf and Potier methods- Principles of operation of automatic voltage regulators - determination of Xd, Xq by slip test.

Parallel operation of alternators - performance of two machines in parallel-synchronising power - effect of speed regulation on load sharing -methods of synchronizing- synchroscope- methods of automatic synchronizing-synchronous machines on infinite bus bars.

Module III

Synchronous motor-torque and power relationship-phasor diagram starting of synchronous motors-losses and efficiency calculations-V curves-synchronous condenser-load angle

Module IV

Power angle diagrams -power flow equation for cylindrical and salient pole machines-reluctance power-maximum power transfer-stability limit-control of active and reactive power in synchronous machines on infinite bus bars.

Symmetrical short circuits (only qualitative analysis) - steady state, transient and subtransient reactance - time constants- Hunting in synchronous machines- natural frequency of oscillations - damper windings.

Text Book:

1. Nagrath I.J. and Kothari D.P. : Theory of AC machines, Tata McGraw Hill
2. Bimbra P.S. : Electrical Machinery, Khanna Publications

References:

1) Say M.G ELBS & Pitman : Performance and design of AC Machines,
2) Langsdorf A.S : Theory of AC machines, Tata McGraw Hill
3) Gupta B.R & Vandana Singhal : Fundamentals of Electrical Machines, New Age International ,1990

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 503 FIELD THEORY

Module I

Overview of vector analysis – Co-ordinate systems – rectangular, cylindrical, spherical - transformations. Divergence theorem, Stokes theorem, Div, Grad, Curl.

Static Electric field: Coulomb's law, superposition, electric flux, electric field, electric scalar potential, dipole, method of images – Gauss law for electric flux, boundary conditions – capacitance of isolated sphere, concentric sphere, co-axial cylinder/cable two wire transmission line- energy stored in electric field / capacitor, energy density. Laplace equation, Poisson's equation, Uniqueness theorem.

Module II

Static magnetic field of steady electric currents – magnetic flux, Biot -Savart law, Ampere's law, Gauss law for magnetic flux –boundary conditions, magnetic vector potential, inductance of a coaxial cable, two wire transmission line, solenoid, toroid. Electromagnetic induction – Faraday's law, self & mutual inductance. Continuity equation – displacement current – Maxwell's equations integral & differential form.

Module III

Uniform plane waves –general solution –TEM waves – relation between electric and magnetic fields, phase and group velocity – plane waves in lossy medium, skin depth, propagation constants and intrinsic impedance – Harmonically varying field, Poyntings theorem-interpretation, application. Wave polarization – linear, elliptic and circular polarization, wave guides – rectangular - modes of propagation- cylindrical wave guides.

Module IV

Reflection of plane waves at boundaries – normal and oblique incidence – refraction – transmission – Snell's law – critical angle – Brewster angle – total internal reflection.

Transmission lines: - Uniform transmission line – VI solution- characteristic impedance – VSWR – impedance matching – quarter wave and half wave length transformer – stub matching – single and double – Smith chart – impedance matching using Smith Chart.

Text Book

1. Sadiku MNO - *Elements of Electromagnetics*, Addison Wesley 2002.
2. Premlet B - *Electromagnetic theory with applications*, Phasor Books 2002.

Reference

1. W. H. Hayt - *Engineering Electromagnetics*, Mc Graw Hill2001.
2. Nannapaneni Narayana Rao - *Elements of Engineering Electromagnetics* – Prentice –Hall, 1998
3. Cheng D.K - *Electromagnetic Fields & Wave*, Addison Wesley 2002.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 504 ELECTRICAL MATERIAL SCIENCE

Module I

Conducting materials: Review of metallic conduction on the basis of free electron theory- Fermi-Dirac distribution – variation of conductivity with temperature and composition, Materials for electric resistances- general electric properties: brushes of electrical machines, lamp filaments, fuses and solder.

Semiconductors: Compound semiconductors – basic ideas of amorphous and organic semiconductor – preparation of semiconductor materials – zone-refining technique – fabrication of p-n-p junction.

Magnetic materials: Classification of magnetic materials – origin of permanent magnetic dipoles – ferromagnetism - hysterisis curve – hard and soft magnetic materials – magnetic material used in electrical machines, instruments and relays.

Module II

Dielectrics: dielectric polarization under static fields – electronic, ionic and dipolar polarizations – behavior of dielectrics in alternating fields – mechanism of breakdown in gases, liquids and solids - factors influencing dielectric strength – capacitor materials Insulating materials – complex dielectric constant – dipolar relaxation dielectric loss insulator materials used – inorganic materials (mica, glass, porcelain, asbestos) – organic materials (paper, rubber, cotton silk, fibre, wood, plastics, bakelite)- resins and varnishes – liquid insulators (transformer oil) – gaseous insulators (air, SF6, and hydrogen) – ageing of insulators.

Module III

Materials for special applications: materials for solar cells/fuels cells/battery- materials for coatings for enhanced solar thermal energy collection – solar selective coatings- cold mirror coatings- heat mirror coatings – antireflection coatings, Sintered alloys for breaker/switch contacts – arcing tips.

Module IV

Modern techniques for Material Studies: optical microscopy – electron microscopy – photoelectron spectroscopy – atomic absorption spectroscopy – magnetic resonance – nuclear magnetic resonance – electron spin resonance – ferromagnetic resonance.

Text Book

1.Indulkar C.S. & Thirivengadam S- *An Introduction to Electrical Engineering Materials*, S Chand Co, 1998.

Reference:

1. Yu Koristky - *Electrical Engineering Materials*, MIR, 1970.
2. Arumugam M - *Materials Science*, Anuradha Publishers, 1990.
3. Meinal A.B & Meinal M.P- *Applied Solar Energy – An Introduction*, Addition Wesley Publications.
4. Kapoor P.L- *Electrical Engineering Materials*, Khanna Publications.
5. Hutchison T.S & Baird D.C - *The Physics of Engineering Solids*, John Wiley Publications.
6. A.J Dekker - *Electrical Engineering Materials*, Prentice Hall of India.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 505 MICROPROCESSOR BASED SYSTEMS

Module I

Intel 8085 and 8086 processors – architecture – memory addressing – addressing modes – instruction set – assembly language programming – assemblers – interrupts – pin configuration - timing diagrams – minimum and maximum mode – multiprocessor configuration.

Module II

Interfacing – address decoding – interfacing chips – programmable peripheral interface (8255) – programmable communication interface (8251) – programmable timer (8253) – DMA controller (8259) – programmable interrupt controller (8257) – keyboard display interface (8279).

Module III

Introduction to 80386 – memory management unit – descriptors, selectors, description tables and TSS – real and protected mode – memory paging – special features of the Pentium processor – branch prediction logic – super scalar architecture.

Module IV

8051 Micro controller – Architecture Basic Assembly Language Programming Concepts – Moving data – Logical Operations- Arithmetic Operations – Jump and call Instructions- / An 8051 Micro controller Design- Applications- Serial data Communication.

Text Books

1. Gaonker R.S. - *Microprocessor Architecture, Programming and applications*.
2. Hall D.V.- *Microprocessors & Interfacing*, McGraw Hill.

Reference

1. Brey B.B. - The Intel Microprocessors – *Architecture, Programming & Interfacing*, Prentice Hall.
2. Liu Y.C & Gibsen G.A - *Microcomputer System - The 8086/8088 family.* Prentice Hall of India.
3. Uffenbeck J.E - *The 8086/8088 Family: Design, Programming & Interfacing*, Prentice Hall of India (P) Ltd.
4. Ray A.K, & Bhurchandi K.W - *Advanced Microprocessors and Peripherals*, Tata McGraw Hill.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE506 LINEAR INTEGRATED CIRCUITS

MODULE I

Integrated Circuits- Introduction to operational amplifiers – basic differiential amplifier – dual input balanced output and unbalanced output – Internal block schematic of op amp - Biasing used in IC – Constant current source - current mirror Circuits – Op – amp parameters – ideal op amp – transfer curve – equivalent circuit –internal circuit analysis of a typical op – amp- frequency response frequency compensation. Slew rate and its effect, typical data sheet 741.

MODULE II

Input bias current – off set – drift – compensating networks CMRR,SVRR, finite gain bandwidth and its effect in opamp circuits performance Open loop configurations Op amp in closed loop configuration : Different feed back configutrations – voltage follower – V/I converters, I/V converters and its applications – Differential amplifiers with one op amp and 3 op amps. Instrumentation amplifier IC and its application.

MODULE III

Op amp applications – Summer – Sub tractor –Log amplifier –Antilog amplifier _ Integrator and differentiator Comparatoprs : zero crossing – using voltage references – regenerative (Schmitt trigger) comparators : window detector application – OP as comparators – Astable and monostable multivibrators – Triangular and tooth wave generators – RC phase shift and Wien bridge oscillators – Sample and hold circuit – peak detector circuit. Precision rectifiers. Voltage regulators – 723 (block diagram, typical low voltage regulator circuit). 78XX, 79XX, 371.

MODULE IV

Specialized ICs and applications: 555 timers – Functional block diagram – A stable multi vibrator , mono stable , multi vibrator and its applications – Voltage to Frequency converter – Automobile tachometer : 566 VCO chip 565 PLL: - PLL applications . ADC and DAC – performance specification – weighted, R – 2R ; successive approximation , flash, integrating ,Filters: Transfer functions – LPF,HPF,BPF,BRF Approximation methods Butter worth – Chebyshev – Active Filters – I order filters, Quality factor Design – Universal Active Filters – All Pass filters. Switched Capacitive Filters.

REFERENCE:

1. Op amps and Linear Integrated circuits : RF Coughlin – Pearson Education /PHI
2. Design with operational Amplifiers Analog Ics: Sargio Franko – 2nd Edition McGraw Hill
3. Linear Integrated Circuits : d roy Chaudary , Shail B Jain
4. Integrated circuits : K.R Botkar
5. Analog Integrated Circuits : Gray John wiely 2 nd edition

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 507 ELECTRICAL MACHINES I LAB

Plotting of the open circuit characteristics of the given d.c. shunt generator at rated speed. Pre-determination of o.c.c. at other speeds and critical resistances of various speeds. Finding the voltage built-up with a given field circuit resistance and the critical speed for a given field circuit resistance.

Load test on the given DC shunt generator and plotting external characteristics – Deduce the internal characteristics and armature reaction curve.

Brake test on DC shunt and series motor and plot the following characteristics:

Output Vs Efficiency
Output Vs Line current
Output Vs Speed
Speed Vs Torque
Line current Vs Torque

a) Study of 3 point and 4 point starters for DC shunt motor
b) Swinburne's test on DC shunt machine and pre-determination of armature current and percentage efficiency when the machine operates as a motor and as a generator delivering ¼, ½, ¾, full and 5/4th rated output.

Hopkinson's Test on a pair of DC Machines and pre-determining of the efficiency of the machine working as motor and as a generator under various conditions of load on the generator.

Separation of losses in a d.c. machine by conducting a retardation test and determination of the moment of inertia of the rotating system.

Separation of losses in d.c. shunt machine by conducting no load test at different excitations and plotting the variations of these losses at various speeds.

Transformers

a) Polarity test on single phase transformers.
b) Connect three single phase transformers to form a 3 phase transformer with YY and DYI connection. Perform the load test, under balanced upf conditions – Plot the efficiency Vs output and % regulation Vs output characteristics.

O.C and S.C test on the single phase transformer and Pre-determination of the following:

Efficiency at various loads and power factors.

Regulation at various loads and lagging and leading power factors.

Equivalent circuits referred to H.V and L.V sides.

Calculation of performance using equivalent circuit and given load connection to the equivalent circuit.

Upf load at which efficiency is maximum.

Separation of losses of single phase transformer into hysteresis and eddy current loss components at normal voltage and frequency.

Sumpner's test on a pair of identical single phase transformers and pre-determination of the efficiency and regulations at various loads and power factor.

Scott connection of the single phase transformers and the performance under various load conditions at Upf and plotting the efficiency curves with

Main transformer secondary alone loaded.

Teaser transformer secondary alone loaded.

Balanced loading.

Unbalanced loading.

Student shall present his/her fair record, notebook duly certified by the Head of the Department, to the examiners at the time of University practical examination.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 508 POWER ELECTRONICS LAB

Part A - Power Electronics

Study of Power devices – power BJT, SCR, power MOSFET, IGBT etc.
Characteristics of SCR and Triac
Characteristics of power MOSFET
Triggering circuits for SCRs – R, RC and UJT triggering
Single phase fully controlled SCR bridge circuit – R load, RL load – effect of free wheeling diode.
Triggering circuits for SCR chopper
Triac triggering
Speed control DC motor using SCR
Study of V/F control of induction motor.
AC controller using Triac
Study of UPS/SMPS

Part B - Op-Amps

Study of Op-Amps

Op-Amp inverter – scale changer – summer – integrator – differentiator – comparator and instrumentation amplifier

Design and setup of low pass – high pass and band pass filters using Op- Amps

Voltage Regulation using 723
PLL measurement of lock range and capture range
Circuits using Op-Amps for wave form generation
Astable, monostable multivibrators
Wein Bridge Oscillator
Triangular and square wave form generation
Precision rectifiers
Schmitt trigger using Op-Amps

According to the facility available in the laboratory any 15 experiments can be conducted.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 601 POWER SYSTEMS – I

Module I

Conventional sources of electrical energy- thermal, hydroelectric, diesel and nuclear power plants-introduction to renewable energy sources- power plant economics – operating coasts- load factor- demand factor- diversity factor- plant factor. Types of tariffs, power factor improvement.

Module II

Overhead transmission systems- arrangement of conductors- sag and tension- transmission line supports and their location, economic span- choice of transmission voltage- line insulators- string efficiency- impulse ratio- arcing horns and rings- failure of insulation- corona- under ground cables- different types- capacitance of single core and three core cables- grading of cables.

Module III

Distribution systems- classification and arrangement of distribution systems- distribution substation layout and arrangement- economic loading of distribution transformers- design of feeders. Kelvin's Law- considerations in primary and secondary distribution system design- current distribution and voltage drop in single-phase and three-phase four-wire distribution systems- voltage drop calculation and design of distributors in ring system- improvement of existing distribution systems- LT capacitor installation- size and connection- Rising mains- Equipment earthling- Electric energy management. Power quality.

Module IV

Performance of transmission lines- calculation of transmission line inductance and capacitance- GMD and GMR- bundled conductors- transposition- ABCD constants- effect of capacitance- nominal T and π methods of calculations- power flow through a transmission line. Methods of voltage control.

Reference:

Soni, Gupta, Bhatnagar - *A course in Electric Power*, Dhanapat Rai & Sons New Delhi, 1996.

A.T Star, - *Generation, Transmission & Utilization of Electric Power*, Sir. Issac Pitman and Sons, 1961.

Turan, Goren - *Electric Power Transmission System Engineering*, John Wiley,1988.

S.L Uppal - *Electric Power*, Khanna Publishers, 1992.

A.S Pabla - *Electric Power Distribution System*, Tata McGraw Hill, 1992.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EE 602 DIGITAL SIGNAL PROCESSING

Module 1

Introduction to signals & systems- Discrete time signals and systems- Properties of discrete systems-linearity,timeinvariance-causality-stability.convolution.difference equation representation of discrete systems -The Z transform-properties of Z transform- the inverse z transform-System Transfer function.

Module 2

Frequency domain representation of discrete time signals. Discrete Fourier series(DFS)-properties Discrete Time Fourier Transform (DTFT) properties, Discrete Fourier Transform(DFT) properties& Fast Fourier Transform(FFT) Decimation in Time & Decimation in Frequency algorithms.

Module 3

FIR digital Filters: Transfer function. Generalized Difference equation representation. Concept of windowing. Non Recursive realization structures-direct (Tapped delay line structure) –cascade realization- Liner phase realization.

IIR Digital Filters : - Transfer function. Difference equation representation. Recursive Realizations Direct form I , Direct form II –Cascade Realization-Parallel realization – Comparison of IIR & FIR filters in terms of computational complexity, memory requirement, hardware complexity, stability .

Module 4

Finite word length effects in digital filters- fixed point arithmetic -Floating point arithmetic- Block floating point arithmetic - Truncation-Rounding - Quantization error in analog to digital conversion-Limit cycles. General DSP architecture- features _ On chip subsystems- memory organization-Addressing modes- Instruction types - TMS320C54X fixed point processor- TMS320C4X floating point processor

Applications of DSP

References:

Cristi, Modern Digital Signal Processing, Ed. 1.
Ashok Ambardar, Analog and Digital Signal Processing, Edition 2.
Avatar Singh, Digital Signal Processing Implementations, Edition 1
John G Proakis & Dimitris G Manolakis : "Digital Signal Processing", PHI, New Delhi
Oppenheim & Ronald W Schafer : "Digital Signal Processing", Prentice Hall India
Sanjit K. Mithra, : " Digital Signal Processing", Tata Mc- Graw Hill

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Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 603 CONTROL SYSTEMS I

Module I

Frequency domain analysis, sinusoidal frequency response. Polar plots and logarithmic plots – Bode plots – Nyquist plots – absolute stability and relative stability from Bode and Nyquist plots.

Module II

Basic theory and properties of Root loci produce for construction of root loci, complete RL diagram.

Control system components: synchros, d.c servomotor, a.c servomotor, stepper motor, tacho generator.

Module III

Design of control systems. Cascade and feedback design. Modes of control .P, I, D and combinations of P, I and D and effects on system performance. On- off control lead, lag, lead-lag design using Bode plots and root locus. PID controller tuning in process control.

Module IV

System design using state feed back. Controllability, Observability.State feed back control. Placement of poles at desired location using state feedback – observers. Design of full order and reduced order observers.

Reference:

Ogata.K- "*Modern Control Engineering*", Law Price Edition.
M.Gopal,"C*ontrol Systems*", Tata Mc Graw Hill.
A.Nagoorkani "*Control Systems*", RBA Publication

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 604 ELECTRICAL DRAWING

Module I

D.C Armature windings- Simplex lap and wave windings.
Sectional front and side elevation of the armature with commutator.
Sectional front and side elevation of the yoke and pole assembly with field winding.
Sectional front and side elevation of an assembled dc machine.

Module II

Transformers

Sectional plan and elevation of core type and shell type single-phase transformer.
Sectional plan and elevation of a three-phase transformer.

Induction Motors

Sectional front and side elevation of slip ring and squirrel cage induction motor.

Alternators

Sectional front and side elevation of salient pole and turbo alternators.

Module III

Three-phase AC windings
Single layer windings- Mush windings and concentric windings.
Double layer lap windings- Full pitched, short pitched and fractional slot windings.
Double layer lap windings.

Module IV

Single line layout of substations.
Single line layout of generating stations.
Single circuit and double circuit transmission towers.

Reference:

Narang K.L - *A text book of Electrical Engineering Drawing* ,Trch India Publication.

S.K Battacharya - *Electrical Engineering Drawing*.

A.K Sawhney - *Electrical Machine Design*, Dhanapath Rai, New Delhi.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 605 MODERN COMMUNICATION ENGINEERING

Module 1

Microwave Communication : Basic principles of microwave links- Microwave Relay Systems – Choice of frequency – line of sight and over the horizon systems – modulation methods – block schematics of terminal transmitters and receivers – microwave repeaters – microwave repeaters – microwave repeaters – microwave antennas – propagation mechanisms – propagation characteristics – path loss models – shadowing models – small scale fading and multipath fading – basic principles of design of microwave link

Module II

Satellite Communication – Orbit of communication satellite – Satellite Constellation – Orbital parameters – Orbital perturbations – Geostationary orbits – Low Earth and Medium Orbits – Look Angles – Frequency selection RF Links – Propagation characteristics – Modulation methods- coding – multiple access – space craft – antennas – transponders – intersatellite link – link power budget – earth station interference – Satellite systems – Geostationary systems – Distress and Safety systems – Navigation systems – direct sound broadcast systems – Direct Television broadcast systems

Module III

Wireless communication systems: Cellular concepts – Cell Splitting and Frequency Reuse - Propagation Mechanisms – Modulation techniques for wireless communication – Analog, Digital and Spread Spectrum modulation – Equalisation, Diversity and Channel coding Diversity Techniques – Multiple access techniques for Wireless Commuications – FDMA,TDMA and CDMA – Wireless systems and standards – AMPS – Global System for Mobile(GSM) – CDMA – General Packet Radio Service – DECT System .

Fiber optic communication: light wave communication systems- Fiber optic cable - optical transmitter and receiver.

Module 1V

Radiation and Propagation of Waves: - (analysis not required) - Electro magnetic Radiation- Waves in free space- polarization - reception- effects of Environment- Propagation of waves:- Ground waves- Sky-wave propagation - space waves- antennas- Basic consideration - wire radiator in space - common terms and definitions- Effects of ground on Antennas- Directional High frequency Antennas - UHF Micro wave antennas - Wide band and special purpose antennas.

References:

1) Electronic Communications : Dennis Roddy and John Coolen, Prentice Hall, India.
2) Electronic Communication Systems : Kennedy & Davis - Fourth Edition-TMH
3) Communication Electronics : Frenzel, McGraw Hill, International Editions.
   For Modules IV & V
4) Communication Electronics : Frenzel MGH

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B

EE 606 ELECTRICAL MACHINES III

Module I

Three phase induction motor - constructional details - slip ring and squirrel cage types- Theory of the induction machine with constant mutual flux - slip phasor diagram - mechanical power and developed torque - Torque slip curves - variation and starting torque with rotor resistance- pull out torque - losses and efficiency - approximate and exact equivalent circuits - circle diagram - No load and blocked rotor tests - performance calculations from the equivalent circuit.

Module II

Starting - starting squirrel cage motors- direct on-line starting auto transformer and star - delta starter - starting current and torque - starting of slip ring motors - design of rotor rheostat.

Effects of harmonics - Harmonic induction and harmonic synchronous torques - cogging, crawling and noise production - methods of elimination - special rotor construction - Deep bar, composite bar and Boucherot rotor constructions - equivalent circuits and torque curves of double cage motors.

Module III

Methods of speed control - pole changing methods - rotor rheostatic control - change of supply frequency - use of SCR for speed control - principle of speed regulation and improvement of power factor by rotor injected emf.

Induction generator Theory - phasor diagram - circle diagram - equivalent circuit - applications.

Synchronous induction motor- construction - rotor winding connections - circle diagram - pulling into step.

Module IV

Single phase induction motor - revolving field theory equivalent circuit - torque slip curve- starting methods - split phase, capacitor start, capacitor run motors shaded pole motor - repulsion start and repulsion induction motor.

Commutator motors - General, principles and theory - commutator as a frequency converter - emf induced in a commutator winding - single phase series motor - theory - phasor and circle diagram - compensating and interpole windings - universal motor - principle of repulsion motor - torque production - phasor diagram - compensated type of motors repulsion start induction motor - applications.

Poly phase commutator motors - Three phase series and shunt type - schrage motor - characteristics and applications .

References:

1) Performance & Design of AC Machines : Say MG
2) Theory of AC Machinery : Langsdorff AC
3) AC Commutator Motors : Openshaw Taylor
4) Alternating Current Machines : Puchstein & Lloyd
5) Electrical Machines Part I & II : Kostenko & Pietrovsky

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 607 MICROPROCESSOR LAB

Part A (Compulsory)

Study of a typical microprocessor trainer kit and its operation

Simple programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes – monitor routines.

Interfacing and programming of 8255 (eg: traffic light control , Burglar alarm, stop watch)

Interfacing and programming of 8253/8254

Interfacing and programming of 8279.

Part B

A/D and D/A converter interface

Stepper motor interface.

Display interface.

Programming of different types of EPROM 2716, 2732, etc…(at least two topics from Part B has to be covered.)

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 608 MINI PROJECT

Each batch comprising of 3 to5 students shall design, develop and realize an electronic product. Basic elements of product design must be considered. Fully software/simulation projects are not allowed. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation including the Bill of Materials and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

i) Attendance and Regularity	10
ii) Work knowledge and Involvement	30
iii) End-Semester presentation & Oral examination	20
iv) Level of completion and demonstration of functionality/specifications	25
v) Project Report	15
Total	100 marks

***Note**: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & co-ordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide*

CS/EB/EC/EE/EI/IT 701 INDUSTRIAL ORGANIZATION AND MANAGEMENT

Module 1

Organisation: Introduction, definition of organization, system approach applied to organization, necessity of organization, elements of organization, process of organization, principles of organization, formal and informal organization, organization structure, types of organization structure .

Forms of business organization: Concept of ownership organization, types of ownership. Individual ownership, partnership, joint stock Company, private and public limited company, co-operative organizations, state ownership, public corporation

Module 2

Basic concept of management: Introduction, definitions of management, characteristics of management, levels of management, management skills

Management theory: Scientific management, contribution of Gilbreth. Gantt, Neo-classical theory, modern management theories

Functions of management: Planning, forecasting, organizing, staffing, directing, motivating, controlling, co-coordinating, communicating, decision making.

Module 3

Personnel management: Introduction, definition, objectives, characteristics, functions, principles and organization of personnel management

Markets and marketing: Introduction, the market, marketing information, market segmentation, consumer and indusial markets, pricing, sales, physical distribution, consumer behaviour and advertisement.

Financial management: the basics , financial accounts, inflation, profitability, budgets and controls, cost accounting, valuation of stock, allocation of overheads, standard costing ,marginal costing

Module 4

Productivity and production: Measurement of productivity, productivity index productivity improvement procedure

Materials management and purchasing: Objectives, functions, importance of materials management. Stores and storekeeping

Inventory control: Classification, functions, inventory models, inventory costs, EOQ, Materials requirement planning

References:

Fraidoon Mazda, Engineering Management-, Addison -Wesley
Koontz and O'Donnell, Essentials of Management, Mc Graw Hill
Kotlar P, Marketing Management, Prentice Hall India
Chandra P , Finance Management
Monks J.G Operations Management

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 702 DESIGN ESTIMATION & COSTING

Module I

Role of national electrical code in the design of electrical installation – electrical symbols and diagrams – design considerations of electrical installations – electric supply systems – protection and protective devices for electric installation against overload – short circuit and earth fault – electric services in building – service connections – service mains – reception and distribution of main supply – sub- circuits – neutral and earth wire – earth bus – guideline for installation of fittings – design and selection of bus bars and bus bar chambers –design, selection, layout, drawing and location of distribution boards and panel boards – control and switch gears – criteria for selection of HT and LT underground cables.

Module II

Design of illumination schemes – various types of light sources – different types of lighting arrangement – energy efficiency in lamps and illumination – design considerations of good lighting schemes – design of lighting schemes for various purposes – lighting calculations – design of flood lighting and street lighting – electrical aspects and considerations for lifts, escalator services and standby generators – design and safety aspects of electrical installations for residential buildings, hospitals, hotels, recreational and assembly buildings and cinema theatre.

Module III

Electrical installations of high rise buildings – design – schematic diagram – layout – estimation and testing of rising main – main supply board and distribution boards for high rise buildings including air conditioners and lift with provision for standby generators and its protection – lighting protection – electrical system design – estimation and costing of commercial buildings – design considerations of electrical installations in Industries – design, estimating and costing of electrical installations for small industries.

Module IV

Selection of EHV and HV power and distribution transformers and switchgears – case studies – design – layout – schematic diagram –estimation and costing – (a) 16MVA – 110/11KV outdoor substation having one or two incoming and 8 or less outgoing – (b) 11KV/415V outdoor substations upto 630KVA – (c) 11KV/415V indoor substation upto 630KVA – (d) bus bar trunking above 630KVA – design of earthing system – earthmat design – design of plate and pipe earthing – shielding of electrical system.

Reference books

Raina & Battacharya, *Electrical System Design, Estimation & costing*, Wiley Eastern
Gupta J.B, *Electrical Installating, Estimating & Costing*, Kataria & Sons
ISI, *National Electric Code*, Bureau of Indian Standard Publications
Cinema Regulation (Rules) & Act
IEEE Standards, IEEE
Relevant Indian Standard Specifiactions, IS Publications.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 703 POWER SYSTEMS-II

Module I

Representation of power system – one line diagrams – impedance and reactance diagrams – per unit and percent quantities – primitive and interconnected networks and their performance equations – y-bus and z- bus matrices and their formulation – effect of off nominal transformer on y-bus – load flow studies – problem formulation – classification of buses – gauss-seidal method – Newton Raphson method and fast decoupled load flow method – line loss computation – voltage dependency consideration in load modeling.

Module II

Economic load dispatch – system constraints – economic dispatch of thermal plants neglecting line losses – optimum load dispatch including transmission line losses – exact transmission loss formula – automatic load dispatching – optimal load flow solution – speed governing mechanism – speed governing of turbo generator – load sharing and governor characteristics – transfer function model – load frequency – control of single and multi area systems – static analysis – automatic voltage regulation – IEEE type I excitation system transfer function model.

Module III

Short circuit studies – faults on power systems – three phase to ground faults – SLGF – DLGF – LLF faults – sequence impedance and sequence network – symmetrical component methods of analysis of symmetrical and unsymmetrical faults at the terminals of an unloaded generator – fault analysis using z-bus phase shift in star – delta transformer banks – faults through impedance – short circuit capacity of a bus and circuit breaker rating.

Module IV

Power system stability studies – steady stage dynamic and transient stability – electrical stiffness – swing equation – inertia constant – equal area criterion applied to the case of a sudden change in mechanical power input – multi machine stability analysis using forward euler method – basic assumptions and algorithms – factors affecting stability – voltage stability problem – causes and mitigation methods – introduction to HVDC and flexible ac transmission (FACTS) systems.

Text Book:

Stevenson W.D Jr - *Elements of Power System Analysis* (TMH)
I.J Nagrath & D.P Kothari - *Modern Power System Analysis*, (TMH)

Reference:

1. S.L.Uppal - *Electrical Power* (Khanna Publication).
2. S.S Rao - *Switch gear & Protection* (Khanna Publication)
3. Soni, Guptha, Bhatnagar & - *A course in Electric Power* (Dhanapat Rai Sons).

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 704 CONTROL SYSTEMS II

Module I

Non-linear systems Characteristics Phase plane analysis liberalization and stability of equilibrium points. Isocline and delta method. Limits cycles of phase plane- stability of limit cycles. Bendixson's criteria.

Module II

Describing function methods and stability of non-linear systems, Harmonic linearisation, describing function method, filter hypothesis- describing function for single valued and double valued non – linear elements- Limit cycles amplitude and frequency- Stability of non-linear systems. Lyapunov's method for non-linear systems. Popov's criterion.

Module III

Discrete time systems, sampling theorem, hold circuits and data reconstruction- z transforms, inverse z transforms, pulse transfer- state variables description of discrete time systems- time domain analysis, stability using Jury's test and Lyapunov's method.

Module IV

Elements of stochastic control- stochastic processes- autocorrelation and cross correlation, power spectral density, ergodicity – Gauss, Markov processes- Wiener filter, introduction to Kalman filter and state estimation.

Reference Book

1. Benjamin.C.Kuo - *Digital Control systems*, Prentice Hall Inc, 1980
2. Hassan.K.Khalil - *Non-linear systems*, Prentice Hall International (UK) 1996.
3. A.Isidori - *Non-linear Control Systems*, Springer verlag New York 1995.
4. S.Wiggins - *Introduction to Applied Non- linear Dynamical Systems and chaos*, Springer Verlag New York 1990.
5. Gene.F.Franklin and David Powel- *Digital Control of Dynamic Systems*, Addison Wesley, 2000.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EB/EE 705(A) COMPUTER COMMUNICATIONS

Module 1

Introduction to computer networks – Types of Networks - Layered architecture- OSI reference model, TCP/IP reference model –Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services. Transmission media - description and characteristics - base band and broad band transmission - synchronous and asynchronous transmission - full duplex and half-duplex links. MODEMS serial communication standards - X-21 digital interface.X.25 Networks.

Module 2

Need for data link layer - Error detection and correction Techniques- Elementary data link layer protocols-sliding window protocols - Multiple Access protocols -Random Access protocols: ALOHA-CSMA and CSMA/CD. Terminal handling - polling, multiplexing and concentration. Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches.

Module 3

Network Layer: Virtual circuits and data grams -Datagram and Virtual circuit service-Routing - different types of congestion control – IP protocol – Subnets – Multicasting - Network layer in ATM.

Transport layer – Transport layer services - design issues – Elements of transport Layer – Internet Transport Protocols (TCP and UDP).

Module 4

Session layer - design issue - data exchange – dialogue management - synchronisation - remote procedure call - client server model.

Application layer - network security and privacy - cryptography – Domain Name System (DNS)- SMTP – SNMP - virtual terminal and file transfer protocols - electronic mail - WWW and HTTP.

References:

Andrew S Tannenbaum, *Computer Networks*, Prentice hall of India Pvt. Ltd, 2003.

Uyless Balack, *Computer Networks, Protocols Standards & Interfaces*, Prentice hall of India Pvt. Ltd, 2000.

Zheng, S Akhtar, *Networks for computer scientists and Engineers*, Oxford Press, 2004

S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education, 2002

Uyless Black, *Computer Networks - Protocols, Standards and Interface*s, PHI Ltd., 1994

Stalling , *Local and Metropolitan Area Networks* Prentice Hall; 6th edition (April 15, 2000)

Jean Walrand *Communication networks,* Richard D Irwin (May 1991) *2nd Edition*

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 705(B) HIGH VOLTAGE DC TRANSMISSION

Module I

DC power transmission – comparison of AC and DC transmission – Economics of Power transmission – Technical performance – Advantages and disadvantages of DC transmission – Reliability – Application of DC transmission. Types of DC links. Converter Station – Converter Units. Planning for HVDC transmission – Choice of voltage level –Modern trends in DC transmission.

Thyristor valve – valve firing – valve design consideration – Grading and damper circuit design – valve protection. Valve tests – Dielectrical and operational tests.

Module II

HVDC Converters – Analysis, Pulse number. Choice of Converter configuration – valve rating – transformer rating .Graetz circuits (simplified analysis only) - with and without overlap. Analysis of 2&3 valve conduction mode and 3 &4 valve conduction mode . Converter bridge characteristics – Rectifier and Inverter characteristics of a 6 pulse and 12 pulse converter.

Module –III

Principles of DC link control. Converter control characteristics – modification of control characteristics – system control hierarchy- firing angle control- individual phase control – equidistant pulse control. Current and extinction angle control. Starting and stopping of Dc link – power control. Stabilization of AC ties. Converter faults and protection – Converter faults, protection against over current and voltages in a converter station – Surge arrestor- protection against over voltage.

Module - IV

Smoothing reactors – DC lines – DC line insulators – DC breakers – basic concept, characteristics, types and applications. Sources of reactive power- static VAR systems- Thyristor controlled reactor – Types of AC filters (Basic concept only)- DC filters – Carrier frequency and RI noise. Multiterminal DC system –Potential. Application and type. Modeling of DC network.

Simulation of HVDC system – system simulation – philosophy and tools only.

Text Books:-

1. K.R.Padiyar, " HVDC Power Transmission Systems"- Willy Eastern Ltd
2. C.L W adhawa – " HVDC Power nTransmission "

References:-

1. E.W .Kimbark, " Direct Current Transmission " , Vol I (New york)- John Wiley
2. E.Uhaman, "Power Transmission by Direct Current" (Berlin) Spinger – Verlag
3. J.Arrillaga, "High Voltage Direct Current Transmission" (London) Peter Peregrinus.

EE 705(C) NEURAL NETWORK AND FUZZY LOGIC

Module I

Introduction to artificial neural networks – biological neurons – Mc Culloch and Pitts modals of neuron – types of activation function – network architectures – knowledge representation learning process – error-correction learning – supervised learning – unsupervised learning – single unit mappings and the perceptron – perceptron convergence theorem (with out proof) – method of steepest descent – least mean square algorithms – adaline/medaline units – multilayer perceptrons – derivation of the back-propagation algorithm.

Module II

Radial basis and recurrent neutral networks – RBF network structure – covers theorem and the separability of patterns – RBF learning strategies – K-means and LMS algorithms – comparison of RBF and MLP networks – recurrent networks – Hopfield networks – energy function spurious states – error performance – simulated annealing – the Boltzman machine – Boltzman learning rule – the mean field theory machine – MFT learning algorithm – applications of neutral network – the XOR problem - traveling salesman problem – image compression using MLPs – character retrieval using Hopfield networks.

Module III

Fuzzy logic – fuzzy sets – properties – operations on fuzzy sets – fuzzy relations – operations on fuzzy relations – the extension principle – fuzzy measures – membership functions – fuzzification and defuzzification methods – fuzzy controllers – Mumdani and Sugeno types – design parameters – choice of membership functions – fuzzification and defuzzification methods – applications.

Module IV

Introduction to genetic algorithm and hybrid systems – genetic algorithms – natural evolution – properties – classification – GA features – coding – selection – reproduction – cross over and mutation operators basic GA and structure.

Introduction to Hybrid systems – concept of neuro-fuzzy and neuro-genetic systems.

Reference:

1) Haykins S - "*Neutral Network a – Comprehensive Foundation*", Macmillan College, Proc, Con, Inc.
2) Zurada J.M - " *Introduction to Artificial Neural Systems*", Jaico Publishers.
3) Driankov D - Hellendoorn H. & Reinfrank M, " *An Introduction to Fuzzy Control*", Norosa.
4) Ross T.J - "*Fuzzy Logic with Engineering Applications*", McGraw Hill.
5) Goldberg D.E - " *Genetic Algorithms in Search Optimisation and Machine Learning*", Addison Wesley.
6) Bart Kosko - " *Neural Network and Fuzzy Systems*", Prentice Hall, Inc., Englewood Cliffs.
7) Suran Goonatilake & Sukhdev Khebbal (Eds) - " *Intelligent Hybrid Systems*", JohnWiley.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 705 (D) OPTIMAL CONTROL THEORY

Module I
Introduction, optimal control problem, formulation, performance measures for optimal control problems.

Module II
Calculus of variations- fundamental concepts, functional of single function, Euler-language equation. Transversality conditions, vector case with various boundary conditions, Piecewise, smooth extremals, constrained extremisation of functional.

Module III
Variational approach to optimal control problems. Necessary conditions for optimal control with different boundary conditions. Linear regulator problem, Tracking problems, pontryagin minimum principle, state in equality constrains, minimum time problems, minimum control effort problems.

Module IV
Dynamic programming, principle of optimality, application to multistage decision making, optimal control example, Recurrence relation of dynamic programming, curse of dimensionality, discrete linear regulator problem, Heamilton-Jacobi Bellman equation, continuous linear regulator problems.

Reference:

1. Donald.E.Kirk - *Optimal Control Theory an introduction*, Prentice Hall Inc. 1970.
2. A.P.Sage - *Optimum Systems Control*, Prientice Hall 1977.
3. HSU & Meyer - *Modern Control, Principles & Applications*, Mc Graw Hill 1968.

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 706 ELECTRICAL MACHINES LABORATORY II

Synchronous Machines
Regulation of alternator by direct loading
Regulation of alternator by emf and mmf methods.
Regulation of alternator by potier and ASA methods
Slip test and regulation of salient pole alternator using two - reaction theory
Synchronizing of alternator to mains by dark lamp & bright lamp method and control of reactive power.

Induction machines
Variation of starting torque with rotor resistance in slip ring induction motor.
Direct load test on induction motor.
Pre determination of Characteristic and equivalent circuit of induction motor from no load and blocked rotor test.
Synchronous induction motor V- curves, pre determination of field current.
Pre determination of characteristic of pole changing motor
Test on Induction generator. Determination of rotor hysterisis.

Special experiments
V/f control of induction motor.
Characteristic of single-phase induction motor.
Complete torque slip characteristic of induction motor.
Characteristic of double cage induction motor.
Slip power recovery schemes:
Cascade operation of induction motor. Determination of slip and load shared by each motor and overall efficiency of the test.
Methods using converter/inverter operations
From the above list, maximum number of experiments may be conducted subject to facility available.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 707 ADVANCED ELECTRICAL ENGINEERING LAB

MATLAB – I – experiments using MTLAB toolbox.
Determination of transfer function of DC motor (a) armature control (b) field control.
Study and experiments on (a) DC servo motor (b) AC servomotor.
Experiments on synchros (a) characteristics (b) data transmission (c) error detection (d) differential synchro.
Determination of transfer function of the amplidyne and load characteristics.
Design and experimental determination of frequency response determination of lag, lead and lag-lead networks.
Magnetic amplifier – characteristics and control circuits.
Static and dynamic performance evaluation of transducer (a) resistance thermometer (b) vibration pick up (c) pH meter.
Study and performance evaluation of transducers (a) strain gauge (b) inductive pick up (c) capacitive pick up (d) LVDT.
Study and experiments on pneumatic control system.
Microprocessor based generation of non-linear functions using proper interfacing and display devices.
PSPICE simulation of single-phase and three-phase diode bridge rectifiers.
PSPICE simulation of three-phase thyristor bridge rectifier.
Power flow analysis of the system with the given single line diagram, using the given power flow analysis package.
Fault analysis of the system with given single line diagram, using the given fault analysis package. Obtain the sub-transient fault currents for DLFG, DLFG, LLF faults at leach bus.
Determination of relay characteristics.

Note: 50% Mark is earmarked for continuous evaluation and 50% mark for end semester examination, to be assessed by two examiners. A candidate shall secure a minimum of 50% marks for two components to be eligible for pass in that subject.

EE 708 SEMINAR

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Electronics & Communication Engineering. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs. The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

EE 709 PROJECT DESIGN

Each batch comprising of 3 to 5 students shall identify a project related to the curriculum of study. At the end of the semester, each student shall submit a project synopsis comprising of the following.

Application and feasibility of the project
Complete and detailed design specifications.
Block level design documentation
Detailed design documentation including circuit diagrams and algorithms / circuits
Bill of materials in standard format and cost model, if applicable
Project implementation action plan using standard presentation tools

Guidelines for evaluation:

i)	Attendance and Regularity	10
ii)	Quality and adequacy of design documentation	10
iii)	Concepts and completeness of design	10
iv)	Theoretical knowledge and individual involvement	10
v)	Quality and contents of project synopsis	10
	Total	50 Marks

Note: *Points (i)-(iii) to be evaluated by the respective project guides and project coordinator based on continuous evaluation. (iv)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.*

EE 801 ELECTRICAL MACHINE DESIGN

Module I

D C Machines:- Output equation – main dimensions choice of specific electro magnetic loadings – choice of speed and number of poles. Design of armature conductors, slots and windings – design of airgap,field system, commutator,interpoles,compensating winding and brushes – Carter's co-efficient – real and apparent flux density. Design examples.

Module II

Transformers; - Single phase and Three phase transformers – output equation - main dimensions – specific electric and magnetic loadings – design of core, LV winding, HV winding – cooling of transformers – design of cooling tank and tubes. Temperature rise time curve – short time and continuous rating.

Module III

Alternators:- Salient pole and turbo alternators – output equation – main dimensions – choice of specific electric and magnetic loadings – choice of speed and number of poles – design of armature conductors, slots and winding – design of air-gap, field system and damper winding – prediction of open circuit characteristics and regulation of the alternator based on design data – design examples.

Module IV

Induction machines:- Output equation – main dimensions – choice of specific electric and magnetic loadings – design of stator and rotor windings, stator and rotor slots and air-gap of slip ring and squirrel cage motors – calculation of rotor bar and end ring currents in cage rotor – calculation of equivalent circuit parameters and prediction of magnetising current based on design data – design examples.

Reference:

Clayton & Hancock - *Performance and Design of DC Machines, ELBS.*
Sawhney - *Electrical Machine Design,* Dhanapath Rai.
Say M.G - *Performance and Design of AC Machines,* Pitman, ELBS.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 802: POWER SYSTEMS III

Module I

Circuit breakers – principles of operation – different types and their operations – ABCB – oil CB – SFC – vacuum CB- circuit breaker ratings – cause of over voltages – surges and traveling waves – voltage waves on loss less line – reflection and attenuation – protection against lightning – earth wires – lightning diverters – surge absorbers- arcing ground – neutral earthing – basic concepts of insulation levels and their selection – BIL – coordination of insulation.

Module II

Protective relays – protective zones – requirement of protective relaying – different types of relays and their applications – generalized theory of relays – protection scheme for generator – transformers, lines and bus bars - static relays amplitude and phase comparators – block diagrams of static relays – protection scheme for generators – transformers, lines and bus bars – microprocessor based protective relaying.

Module III

Electric traction: systems of traction – speed time curve – mechanics of traction – power supply – systems of current collection – electric heating – advantage of electric heating – resistance and induction are furnaces – construction and field of application of dielectric heating.

Module IV

Energy conservation in electric motors – lighting and electric heating systems – electrical energy auditing – instrumentation and general methodology – power quality problems – definitions – harmonics – sources – effects – total harmonic distortion (THD) – mitigation methods – passive filter design.

Reference:

Rao S.S - *Switch Gear protections*, Khanna.
Thomas & Browne Jr - *Circuit Interruption – Theory and Techniques*.
Soni, Gupta & Bhatnagar - *A Course in Electrical Power*, Dhanapat Rai.
Van.C Warrington A.R - *Protective Relays Vol.1 & 2*, Chappman & Hall.
Mason C.R - *Art and Science of Protective Relaying*, Wiley Eastern.
Ravindranath, Chander.M - *Power System Protection and Switchgear*, Wiley Eastern.
Haydt G.T - *Electric Power Quality*, Stars in circle publications.
Kazibwe W.E & Sendula M.H.- *Electric Power Quality*.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 803 ELECTRONIC INSTRUMENTATION

Module I

Transducers – definitions – classifications – resistance transducers- strains gauge – types – construction – temperature effect - circuitry, semi conductor strain gauge – load cell.
Resistance thermo meter – types – circuits – errors. Themistor – advantage of themistor.

Inductive transducers – LVDT – applications – LVDT load cell – LVDT pressure transducer – resolver – capacitive transducer – principle of operation – applications – capacitor microphone.
Piezoelectric transducer – materials – equivalent circuit – d, g, h, coefficients – thermocouple – principle – applications – magnetostrictive transducers – materials, applications, Hall effect transducer – application – elastic transducers (brief study) – Bourdon tubes – diaphragms – Bellows – Fibre Optics transducers – digital transducers – shaft encoder.

Module II

Signal conditioning – instrumentation amplifiers – differential amplifiers – filters – law and high pass, band pass and band rejection filters –transducer bridges – null type and deflection bridges – AC bridges using push pull transducers – general telemetry systems – sampling process – principles of time division and frequency division multiplexing, different types of modulation techniques as applied to telemetry (general idea)

Module III

Instrumentations systems – basic measuring systems – analog and digital data acquisition systems – generalized input-output configuration of measuring systems – dynamic characteristics.
Digital instruments – operating principles of DVM using successive approximation – V/F conversion and integrating principles – counter digital method for frequency, phase, time and period measurements – digital RLC meters – Q-meter – vector impedance meter – electronic multimeter.

Module IV

Display methods and devices – different types of display – display system building blocks – recorders – galvanometric recorders-pen driving systems – servo recorders – magnetic recorders – digital recorders – accuracy and precision – classification errors- combined errors etc.

Text Book

1. A.K Sawhney - *A course in electrical and electronic measurements and Instrumentation*, Dhanapath Rai & Co. 2001 eddition.
2. Ernest O.Doeblin - *Measurements systems application & design,* McGraw Hill International edition 1984.
3. Albert D. Helfric & William D. Cooper - *Modern Electronic Instrumentation & Measurements Techniques* (Prentice Hall)
4. Dr. S. Renganathan - *Transducers Engineering* (Allied Publishers Ltd. Delhi
5. K.B Kalaasen - *Electronic measurement and instrumentation*, Cambridge University press 1996.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

CS/EC/EE/EI 804A DIGITAL IMAGE PROCESSING

Module I

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry.
Review of matrix theory results: Row and column ordering - Toeplitz, Circulant and Block matrices. Review of Image transforms: 2D-DFT, FFT, Walsh, Hadamard, Haar, DCT and Wavelet transforms.

Module II

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering. Generation of spatial masks from frequency domain specifications.
Image segmentation: Detection of discontinuities - point, line and edge and combined detection , Edge linking and boundary description - local and global processing using Hough transform – Thresholding - Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging - Use of motion in segmentation. Fundamentals of Representation and Description.

Module III

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations.
Fundamentals of Colour image processing: colour models - RGB, CMY, YIQ, HIS - Pseudo color image processing - intensity slicing, gray level to color transformation.

Module IV

Image compression: fundamentals- redundancy: coding, inter pixel, psycho visual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG, MPEG & Fractal image compression techniques.

Text Book:

1. Gonzalez and Woods, *Digital Image Processing*, Pearson Education/ Prentice-Hall India Ltd., 2nd ed.

References:

1. Anil K. Jain, *Fundamentals of Digital Image Processing*, Pearson Education/ PHI Ltd, 2003.
2. Mark Nelson, Jean-Loup Gailly, *The Data compression Book*, BPB Publications, 2nd ed.
3. Pratt William K., *Digital Image Processing*, John Wiley & sons, 2nd ed.
4. Chanda & Majumdar, *Digital Image Processing and Analysis*, Prentice-Hall India Ltd, 2003.
5 M. Sonka, V. Hlavac, R. Boyle, *Image Processing, Analysis and Machine Vision*, Thomson Learning, 2006

EE 804 (B) RENEWABLE SOURCES OF ENERGY

Module I

Renewable and non-renewable sources of energy – brief review of conventional sources of energy – energy production and world energy consumption – green house effect and global warming. Solar energy option. Thermal conversion – design fabrication and performance of flat plate collectors – description of solar thermal devices (stills water heater, furnaces cookers and refrigerators) – Solar thermal power generation systems – thermal storage.

Module II

Photovoltaic conversion – conceptual description of photo voltaic effect – electrical characteristic of silicon PV cells and modules – solar cell material and prospects – Instruments for measurement of solar radiation – Empirical equations for predicting availability of solar radiation.

Module III

Wind energy – wind turbines – Horizontal axis and vertical axis with turbines – Power and energy from wind turbines – wind characteristics. Energy from oceans: wave energy – Physical principles – wave characteristics and wave power – wave energy technology. – fixed devices – floating devices

Module IV

Biomes – classification – biomass – conversion process – application – ocean thermal energy conversion systems – Tidal & wave power application – fuel cells – types – losses in fuel cell - application – MHD generators – application of MHD generation - micro and mini hybrid power.

References:

Renewable energy sources – John W, Twidell & Antony D. Wier – ELBS Publication

Renewable Energy - Power for sustainable Future – Edited by Godfrey Boyle – Oxford University Press in association with the Open University, 1996.

Applied solar Energy - Meinel A B and Meinel MP, Addison Wesley Publications.

Renewable and Novel energy sources – SL Sah, MI Publications, New Delhi, 1995.

Direct Energy Conversion – George Sutton – McGraw hill Publications.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 804 C : FLEXIBLE AC TRANSMISSION

Module 1

FACTS concepts and general system considerations: Power flow in AC systems - Definition of FACTS - Power flow control -Constraints of maximum transmission line loading - Benefits of FACTS Transmission line compensation- Uncompensated line - shunt compensation - Series compensation -Phase angle control.

Module 2

Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control - Comparison between SVC and STATCOM.
Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators - TCVR and TCPAR- Operation and Control -Applications.

Module 3

Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPFC- Basic Principle of P and Q control- independent real and reactive power flow control- Applications - Introduction to interline power flow controller.

Module 4

Special purpose FACTS controllers - Thyristor controlled voltage limiter - Thyristor controlled voltage regulator - Thyristor controlled braking resistor - Thyristor controlled current limiter-
Custom Power - Compensation Devices - STS - SSC - SVR -Backup energy supply devices

Reference Books:

1. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

2. R. Sreeram Kumar (Ed) "Lecture Notes on Flexible AC Transmission Systems (FACTS)". Institution of Engineers (India), Calicut Local Centre, 2003.

3. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut,2003

4. T.J.E. Miller. "Reactive Power Control in Electric Systems", JohnWiley & Sons, 1984.

Type for questions for University Exams

Question (1) - Eight short answer question of five marks with two questions from each of four modules

Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EB/EE 804(D) VLSI DESIGN

Module I.

VLSI process integration: - fundamental considerations in IC processing - NMOS and PMOS IC technology - CMOS IC technology - BiCMOS IC technology. - GaAs technology. Ion implantation in IC fabrication. The MOS device - (n - channel & p- channel) - capacitance of MOS structure - accumulation, depletion and inversion, threshold voltage, current equations - characteristics, channel pinch-off. Second order MOS device effects : short-channel effect, narrow width effect, sub-threshold current, device saturation characteristics.

Module II.

Switch logic- pass transistors and transmission gates, Gate logic-The basic inverter using NMOS-circuit - current equations - pull up to pull down ratio- transfer characteristics- Alternate forms of pull up. Basic NAND, NOR circuits. The CMOS inverter, characteristics – NAND, NOR and compound circuits using CMOS. Other forms of CMOS logic : pseudo CMOS, CMOS domino logic, n-p logic. Layout design of static MOS circuits – Layout rules - general principles & steps of lay-out design - use of stick diagrams - design rules - Layout examples of NAND and NOR.

Module III.

Basic circuit concepts: sheet resistance, area capacitance, delay unit, inverter delays – driving large capacitive loads, cascaded inverters, super buffers, BiCMOS drivers . Combinational circuits - clocked sequential circuit - drivers for bus lines. Scaling of MOS circuits: scaling models and scaling factors for device parameters.

Module IV.

Timing issues in VLSI system design: timing classification- synchronous timing basics – skew and jitter- latch based clocking- self timed circuit design - self timed logic, completion signal generation, self timed signaling–synchronizers and arbiters.

Text Books

Douglas A Pucknell, Kamran Eshraghian , *Basic VLSI Design*, P HI
Jan M. Rabaey, A. Chandrakasan, B. Nikolic *Digital Integrated Circuits- A Design perspective* 2/e, Pearson education

References

Thomas E. Dillinger , *VLSI Engineering* , PH International editions.
S M Sze, *VLSI Technology,PHI*
Weste and Eshraghian, *Principles of CMOS VLSI Design ,A Systems Perspective*,2/e, Pearson Education.
Mead & Conway , *Introduction to VLSI System Design*-Addison Wesley
Fabricius, *Introduction to VLSI Design,*Pearson
Charles H Roth Jr – *Fundamentals of Logic Design 4 Ed*, Jaico Publishers
Wayne Wolf:Modeern *VLSI Design Systems on Chip*-Pearson Education,2nd ed.,

Type for questions for University Exams
Question (1) - Eight short answer question of five marks with two questions from each of four modules
Question (2-5) - Two questions A & B of 15 Marks from each module with options to answer either A or B.

EE 805 PROJECT WORK

Each batch of students shall develop the project designed during the VII semester. The implementation phase shall proceed as follows:

For hardware projects, practical verification of the design, PCB design, fabrication, design analysis and testing shall be done.
For software projects, a proper front end (GUI) if applicable, shall be designed. A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.
Integration of hardware and software, if applicable, shall be carried out.
A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report.
The work shall be reviewed and evaluated periodically

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the project guide and shall include the following.

Presentation of the work
Oral examination
Demonstration of the project against design specifications
Quality and content of the project report

Guidelines for evaluation:

Regularity and progress of work	30
Work knowledge and Involvement	100
End semester presentation and oral examination	50
Level of completion and demonstration of functionality/specifications	70
Project Report – Presentation style and content	50
Total	300 marks

Note: *Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.*

EE 806 VIVA-VOCE

Each student is required to appear for a viva-voce examination at the end of the complete course work. The students shall produce the seminar report and project reports duly attested by the institutional authorities, before the examiners. The examination panel shall comprise of one internal examiner and one external examiner, both appointed by the University. The examiners shall evaluate the students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.