BE (Electrical and Electronics Engineering)

BE (EEE) - I SEMESTER

THORY			SESSIONAL		
CODE	TITLE	UNIT	CODE	TITLE	UNIT
HU 1101	Technical English	1.0	ME 1102	Engineering Graphics	1.0
PH 1101	Physics- I	1.0	CP 1202	Unix & C Programming	1.0
CH 1201	Engineering Chemistry	1.0	PH 1102/	Physics Lab./	
MA 1101	Mathematics- I	1.0	CH 1202	Chemistry Lab.	0.5
ME 1101	Engineering Mechanics	1.0	PE 1102	Work Shop Practice- I	0.5
			GA 1002	NCC/ NSS/ PT & Games/ Creative Arts	0.5

BE (EEE) - II SEMESTER

MA 2101	Mathematics- II	1.0	ME 2102	Computer Aided Drafting	1.0
EE 2101	Basic Electrical Engineering	1.0	CH 1202/	Chemistry Lab./	
CP 2101	Data Structure in C++	1.0	PH 1102	Physics Lab.	0.5
CH 2103	Environmental Science	1.0	ME 2104/	Engineering Mechanics Lab./	
PH 2103	Physics- II	1.0	EE 3102	Basic Electrical Engineering Lab.	0.5
			CP 2102	Data Structure Lab.	0.5
			PE 2102	Workshop Practice- II	0.5
			GA 2002	NCC/ NSS/ PT & Games/ Creative Arts	0.5

BE (EEE) - III SEMESTER

MA 3103	Mathematics III	1.0	EE 3102	Basic Electrical Engineering Lab	0.5
EC 3101	Basic Electronics	1.0	ME 2104/	Engg. Mechanical Lab/	
EE 3101	Introduction to System Theory	1.0	EC 3102	Basic Electronics Lab	0.5
ME 3207	Principle of Mechanical Engg.	1.0	PH 3102	Material Science Lab	0.5
PH 3101	Material Science	1.0	EE 3104	MATLAB Lab	0.5
EE 3103	Electric Energy Generation & Control	1.0	GA 3002	NCC/NSS	0.5

BE (EEE) - IV SEMESTER

EE 4101	DC Machines and Transformer	1.0	EE 4102	Electrical Machine Lab. I	0.5
EE 4103	Electrical Measurement	1.0	EC 4102	Digital Electronics Lab.	0.5
EC 4105	Discrete and Integrated Analog Circuits	1.0	EC 4106	Integrated Circuits Laboratory	0.5
EC 4101	Digital Electronics	1.0	CP 4104	Scientific Computing Lab.	0.5
EE 4105	Networks Theory	1.0	GA 4002	NCC/NSS/Games/Creative Arts	0.5
CP 4103	Scientific Computing	1.0			

BE (EEE) - V SEMESTER

EE 5101	AC Rotating Machines	1.0	EE 5102	Electrical Machine Lab.- II	0.5
EE 5103	Electric Power Transmission & Distribution	1.0	EE 5108	Digital Signal Processing Lab.	0.5
EE 5105	Engineering Electromagnetic	1.0	EE 5110	Measurements & Instrumentation Lab.	0.5
EE 5107	Digital Signal Processing	1.0	EE 5112	Microprocessor Lab.	0.5
EE 5109	Electronic Instrumentation	1.0			
EE 5111	Microprocessor & Microcontroller	1.0			

BE (EEE) - VI SEMESTER

EE 6101	Fundamental of Communication System	1.0	EE 6102	Electrical Design Drawing and CAD	1.0
EE 6103	Power System Analysis	1.0	EE 6106	Control System Laboratory	0.5
EE 6105	Linear Control Theory	1.0	EE 6108	Power Electronics Lab.	0.5
EE 6107	Power Electronics	1.0	EE 6110	RDBM Lab.	0.5
EE 6109	Relational Data Base Management	1.0	EE 6112	Project	0.5

BE (EEE) - VII SEMESTER

EE 7101	Applied Power Electronics	1.0	EE 7102	Applied Power Electronics Lab.	0.5
EE 7103	Industrial Drives & Control	1.0	EE 7104	Power System Lab.	0.5
EE 7105	Switch Gear and Protection	1.0	EE 7112-7122	Sessional/ Lab. on Elective - I	0.5
EE 7107	High Voltage Engineering	1.0	EE 7106	Project	0.5
PE 7209	Engineering Economics	1.0			
	Elective - I	1.0			

LIST OF ELECTIVES (ELECTIVE – I)

EE 7111	Computer Aided Power System Analysis
EE 7113	Testing & Commissioning of Electrical Equipment
EE 7115	Control System Design
EE 7117	Neural Network
EE 7119	Embedded System and Advanced Processors
EE 7121	Microprocessor Applications

BE (EEE) - VIII SEMESTER

EE 8101	Applied Control Theory	1.0	EE 8102	Simulation Lab.	0.5
EE 8103	Utilization of Electrical Power	1.0	EE 8108-		
EE 8105	Information Technology	1.0	EE 8132	Lab/Sessional Based on Elective	0.5
MB 6101	Principles of Management	1.0	EE 8104	Project	1.0
EE 8107-	Elective - II	1.0			
EE 8131	Elective - III	1.0			

LIST OF ELECTIVES (ELECTIVE - II & III)

EE 8107	Fuzzy Logic Control
EE 8109	Artificial Intelligence
EE 8111	Robotics
EE 8113	Power System Dynamics & Reliability
EE 8115	Modern Power System Operation & Control
EE 8117	Bio-Electronics Instrumentation
EE 8119	VLSI Design
EE 8121	Computer System Architecture
EE 8123	Indian Constitution and Professional Ethics
EE 8125	Specifications & Estimation of Electrical Installations
EE 8127	Neuro-Fuzzy Technique in Power Systems
EE 8129	EHV Power Transmission
EE 8131	Direct Energy Conversion

FIRST SEMESTER

HU 1101	TECHNICAL ENGLISH	1.0

MODULE – I

Single word substitution, Idioms and phrases, Pairs of words, Common errors, Précis, Comprehension, Expansion.

MODULE – II

Official Correspondence - Memorandum, Notice, Agenda, Minutes, Circular letter, applying for a job, Resume, Demo-official letter.

MODULE – III

Business Correspondence-Types, sales letters; Social Correspondence- Invitation to speak, Congratulations; etc.

MODULE – IV

Report writing; general and technical report, Definition, Types, structure.

MODULE – V

Technical proposals, Definitions, types and format.

MODULE – VI

Research papers and articles.

MODULE – VII

Mechanics of manuscript preparation.

BOOKS FOR REFERENCE:

1. Blickle, Margaret D., and K.W.Houp.
2. Reports for Science and Industry, Henry Holt & Co. N.Y.
3. Duddy, E.A. & M.J. Freeman Written Communication in Business, Amercian book Co. N.Y.
4. Berry, Thomas Elliot, The most Common Mistakes in English Usage; Tata McGraw Hill.
5. Stevensin, B.W., J.R. Spicer and E.C. Ames, English in Business and Engineering. Prentice Hall, Eaglewood
6. Cliffs, N.J.
7. Raul, Asha, Effective Business Communication, Prentice Hall of India.
8. Singh B. Business Correspondence including Bank letters.
9. Singh B. Theory and Practice of Business Correspondence, HPJ Kapoor Publications.
10. Report Writing and Business Correspondence Mohan and Sharma, Tata McGraw Hill Publications, India.
11. Best, W.D. The Students companion, Rupa & Co. Publications.

PH 1101	PHYSICS- I	1.0

MODULE – I

Waves and Oscillations: (SS* : Wave motion: longitudinal and transverse waves, plane waves, phase velocity). Wave packets and group velocity, wave equation, superposition of waves (RHK-Ch-18), equation of motion of simple harmonic oscillator and solutions, damped harmonic motion and forced oscillations(RHK 17.2-17.4,17.7,17.8)

[6]

MODULE – II

Fields: Vector and scalar fields, physical and mathematical concepts of gradient, divergence and curl (Cartesian coordinates only), Gauss's theorem and Stokes' theorem (Statements only, SAD-Ch.3).

[5]

MODULE – III

Electromagnetic Theory: Gauss's law in integral and differential form, electric potential and relation with E(SAD 4.5-4.8),(SS*- capacitance(SAD-6.5) and electrostatic energy density (SAD 4.10)), dielectrics, three electric vectors, dielectric susceptibility boundary conditions on E and D(SAD 5.5-5.7, 5.9).

[5]

Amperes law in integral and differential form, applications.(SAD 7.1-7.4), Hall effect (RHK-32.4), three magnetic vectors (SAD 7.5), magnetic permeability and susceptibility, boundary conditions on B and H (SAD 8.5-8.7).

[5]

Faraday's law in integral and differential form(SAD 9.2-9.3), (SS - Inductance, magnetic energy density (SAD 8.8, 8.9)), continuity equation for charge (SAD 5.8), displacement current (SAD 9.4), Maxwell's equations in free space (SAD 9.5), electromagnetic wave equation for plane waves in dielectric medium and free space, relation between $\vec{E}$, $\vec{B}$ and $\vec{k}$, Poyinting vector (SAD 10.3-10.7).

[5]

MODULE – IV

Plasma Physics: Plasma state, types of plasma, applications of plasma(FFC-Ch-1,2)

[4]

MODULE – V

Physical Optics:

Interference: Two-Beam Interference(AG 12.1-12.6), interference in thin films and wedge-shaped layers(AG 13.8-13.9), reflection and anti-reflection coatings(AG 13.2-13.4), applications of interferometry: Newton's rings(AG 13.10), Michelson' Interferometer (AG 13.11)

[5]

Diffraction: Fraunhofer diffraction by single slit(AG 16.1-16.3) , double slit and grating (AG 16.6-16.8), limit of resolution, Rayleigh criterion(AG 16.5), Fresnel diffraction(Qualitative, AG 17.1-17.3)

[5]

Polarization : (SS- Polarization of light, Malus's law, polarization by reflection, Brewster's law, Double refraction) Analysis of linearly and circularly polarized light(RHK 44.1-44.5), Fresnel's equations and their applications (AG 21.1-21.2)

[5]

Text Books:

1. Mathew N.O. Sadiku (SAD), Elements of Electromagnetics, Oxford University Press
2. (2001)
3. A.Ghatak(AG), Optics, 3rd Edition, Tata Mcgraw Hill, 2005
4. Resnick, Halliday and Krane(RHK), Physics- Part-I & II, 5th Edition, John Wiley (
5. 2002)
6. F.F.Chen(FFC), Introduction to Plasma Physics, 2nd Edition, Plenum Press, 1994

References:

1. W.H.Hayt and J.A.Buck, Engineering Electromagnetics, Tata McGraw Hill (2006)
2. M.R.Srinivasan, Physics for Engineers, New Age International, 1996
3. S.N.Sen, Introduction to Plasma Physics, Pragati Prakasan, Meerut -1, India

MODULE – I

Chemical Bonding: Trends in periodic properties (ionization energy, electron affinity, electro negativity), VBT, VSEPR theory, MOT for diatomic molecules and polyatomic molecules, coordination complexes & ligands, CFT, colour and magnetism of coordination complexes, spectrochemical series

MODULE –II

Kinetics and catalysis: kinetics of chain reactions, parallel reactions, side reactions, fast reactions in solutions, flash photolysis, kinetics of catalytic action (acid base catalysis, biological catalysis), application of catalyst in industrially important processes (Haber's processes, Ostwald process, Bergius process)

MODULE – III

Thermo-chemistry and Fuels: Hess's law, entropy, enthalpy and combustion calculations, characterization and application of fossil fuels, solid fuel (carbonization & gassification), liquid fuels (refining, reforming, petrol & diesel, knocking characteristics, octane and cetane number) and gaseous fuels (water gas, producer gas, coal gas and biogas), lubricants and its properties

MODULE –IV

Electrochemistry and corrosion sciences: Redox process cell, potential and free energy, galvanic cells, electrolysis and Nernst's equation, Fuel cells, and its applications, chemical and electrochemical corrosion, general methods of corrosion prevention (with brief introduction to chemistry of paints, varnishes and enamel)

MODULE –V

Fundamentals of spectroscopic techniques: Basic principles of vibrational, rotational and Mossbauer spectroscopy

MODULE – VI & VII

Macromolecules: Classification, Addition and Condensation polymers, molecular weight of polymers (M_n, M_w, M_v), glass transition temperature (T_g), structure property relationship in polymers (chemical, electrical, optical and mechanical), examples and use of inorganic polymers, synthesis of some commercially important polymers and their use (Nylon 6, Nylon 6, 6, PE, PET, PS)

MODULE – VI & VII

An introduction to computational chemistry

Text Book:

1. Applied chemistry A text book for engineers and technologists, H. D. Gesser, Plenum publishers.
2. Inorganic chemistry: J. D. Lee.
3. Engineering chemistry: Sashi Chawla

Reference:

1. Fundamentals of molecular spectroscopy: C. N. Banwell, TMH publication
2. Computational chemistry: E. Lewars, Kluwer publication
3. Physical chemistry: P. W. Atkins

Analytical Trigonometry:
De-Moivre's Theorem and its applications. Expansion of Sinx and Cosx in powers of x. Complex arguments. Separation into real and imaginary parts Gregory's Result. Expansions. Summation of trigonometric Series. Hyperbolic functions.

(8L)

Differential Calculus:
Successive Differentiation. Leibnitz's Theorem. Rolle's Theorem. Lagrange's and Cauchy's Mean value Theorem. Generatalised Mean value Theorem. Taylor's and Maclaurin's infinite series. Cartesion and polar subtangenent and Subnormal. Pedal equations. Orthogonal intersection of curves. Curvature and radius of Curvature in case of Cartesian parametric, polar, pedal and trangential polar forms. Centre of curvature and evolute. Indeterminate forms L Hospital's Rule. Concavity, convexity and points of inflexion. Asymptotes (cartesian Co-ordinates only).

Functions of two variables. Partial derivatives. Euler's Theorem on Homogeneous functions. Its generalisation and extension. Total differential and derivatives. Errors and Approximations. Taylor's series in case of two variables. Maxima and Minima of two variables. Lagrange's method of Undertermined multipliers in case of two and three variables. Jacobians. Envelope of curves. Tangent planes and Normal lines.

(22L)

Integral Calculus:
Reduction Formula. Beta and gamma functions. Area, length, volume and surface area without the use of multiple integrals.

(9L)

Infinite series:
Convergency and Divergency of infinite series. Tests for Convergence. Comparison Test, p series test, Cauchy's root test. D' Alembert's ratio test, Razabe's Test, Gauss's Test, Logarithmic and Higher logarithmic ratio test (No proof). Leibnitz's Rule for alternating series test.

(6L)

Books Recommended:

1. Higher Trigonometry. Das and Mukherjee (U.N. Dhur & Co.)
2. Differential Calculus. Pran Nath and Agarwal. Tara Publications, Varanasi
3. Integral Calculus. Das and Mukherjee (U.N. Dhur & Co.)
4. Engineering Mathematics. H.K. Dass
5. Higher Engineering Mathematics B.S. Grewal (Khanna Publishers)

Equivalent Force System and Equilibrium: Principles of statics, laws of mechanics, freebody diagram, coplanar, non-coplanar and spatial force system and conditions of equilibrium, vector representation and analysis of forces and moments, Varignon's theorem.

Structural Mechanics: Analysis of simple plane truss by method of sections and methods of joints, analysis of frames and parabolic cables, cantilever and simply supported beams with concentrated, distributed and moment loads, shear force and bending moment diagrams, concept of stress and strain.

Interfacial Friction: Friction and impending motion, static, kinetic and rolling friction, application to inclined planes, wedges, screws jacks and belts.

Kinematics and Kinetics of Particle and Rigid Bodies: Conceptual framework and vector representation of displacement, velocity, acceleration, linear and angular momentum, rectilinear and curvilinear motion in two dimensions, centroidal and non-centroidal rotation, general plane motion, Newton's laws of motion, D'Alembert's principle, equilibrium of dynamic forces.

Work and Energy: Translation and rotation of rigid body about a fixed axis, conservation of energy, energy and work equations in translation and rotational motion, virtual work.

Impulse and Momentum: Impulse force and momentum, conservation of momentum, coefficient of restitution, momentum equation. Vibrating Systems: Inertia, features of a vibrating system, free vibration, systems with single degree of freedom.

Books Recommended:

1. Kumar, Engineering Mechanics
2. Shames, Engineering Mechanics

SECOND SEMESTER

MA 2101	MATHEMATICS- II	1.0

Integral Calculus:
Operations under the sign of integration, Multiple integrals, change of order of integration, Transformation of Co-ordinates, Area, Volume and Surface area of solids using multiple integrals.

(8L)

Ordinary Differential Equations:
Linear differential equations: Bernoulli's from Exact equations, Nonlinear equations, Clairaut's form, Higher order equations with constant coefficients. Cauchy's and Legendre's differential equations. Solution of higher order equation by the change of independent variable, Method of variation of Parameters in Simple cases,

Applications to Engieering problems.

Series solution of Differential equations by the method of Frobenius.(Roots differing by non integer and equal roots).

(14L)

Algebra of Matrices:
Rank of a matrix. Consistency and inconsistency of a system of linear equations. Eigen values and eigen vectors. Cayley Hamiliton Theorem.

(3L)

Vector spaces:
Definition, examples and some simple properties. Subspaces, linear combination, linear dependence and independence, Basis and dimension. Norm of a vector, Inner Product. Cauchy-schwartz inequality, orthogonal sets. Gram-schmidt process of construction of orthogonal sets. Parallelogram law and Pythagorian theorem.

(8L)

Vector Calculus and Tensor Analysis:
Differentiation of vectors, Radial and transverse, tangential and normal acceleration of a particle moving on a plane curve. Directional derivatives, Gradient, Divergence and Curl. Expansion Identities. Vector integration. Conservative system of forces. Solenoidal and Irrotational vectors. Theorems of Green, Stoke and Gauss and their applications,

Tensors, transformation of Co-ordinates, contravariant and covariant vectors and Tensors. Rank of a tensor. Addition and multiplication of tensors. Mixed tensors Contraction.

(10L)

Books Recommended:

1. Advanced Engineering Mathematics byE. Kreyszig
2. Advanced Mathematics for Engineers By Chandrika Prasad (Prasad Mudranalaya)
3. Advanced Engineering Mathematics By H.K. Das.

MODULE – I

Introduction: Importance of Electrical Engineering in day-to-day life. Electrical elements and their classification. KCL and KVL equations. Loop current and Node voltage method. D.C. Circuits: Steady state analysis with independent and dependent sources; Series and Parallel circuits; Star-Delta conversion. D.C. Circuit Theorems: Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(12)

MODULE – II

A.C. Single-phase Series Circuits: Common signals and their waveforms. RMS and Average value. Form factor & Peak factor of sinusoidal waveform. Impedance of Series circuits. Phasor diagram. Power. Power factor. Power triangle.

(5)

MODULE – III

A.C. Single-phase Parallel Circuits: Admittance method, Phasor diagram. Power. Power factor. Power triangle.

(5)

MODULE – IV

Resonance and Q-factor, A.C. Circuit Theorems: Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(7)

MODULE – V

Three Phase Circuits: Line and Phase relation for Star and Delta connection. Power relations. Analysis of balanced and unbalanced 3 phase circuits.

(7)

MODULE – VI

Magnetic Circuits: Introduction. Series-parallel magnetic circuits. Analysis of Linear and Non-linear magnetic circuits. Energy storage. A.C. excitation. Eddy currents and Hysteresis losses.

(5)

MODULE – VII

Coupled Circuits (Dot rule), Self and mutual inductances, Coefficient of coupling.
Basic Indicating Instruments: Moving coil and moving iron type instruments.

(4)

Books Recommended:

1. Nagrath and Grabel, Basic Electrical Engineering
2. Fitzzerald and Higinbotham, Basic Electrical Engineering

MODULE – I & II

Introduction to C++ and algorithm analysis: C++ classes, C++ details, Using matrics, Mathematical background for algorithm analysis, model and what to analyze, Running Time calculations.

MODULE – III

Lists, Stacks and Queues: Abstract Data Types, The list ADT, The Stack ADT, The Queue ADT

MODULE – IV

Trees: Preliminaries, Binary Trees, The Search Tree ADT – Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals, B-Trees.

MODULE – V

Hashing and Priority Queues: Model and Simple implementations, Binary Heap, Applications of Priority Queues, d-Heaps, Leftist and Skew Heaps.

MODULE – VI

Sorting: Preliminaries, Insertion sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, and Quick short.

MODULE – VII

Graph Algorithms: Definitions, Topological Sort, Shortest Path Algorithms, Network Flow Problems and Minimum Spanning Tree.

Text Books:

1. Mark A. Weiss – Data Structures & Algorithm Analysis in C++, 2nd Edition, Pearson Education, New Delhi – 2002.

Reference:

1. Gregory L. Heilean – Data Structures Algorithms, and Object Programming, Tata McGrow Hill, New Delhi – 2002.
2. Adam Drozdek – Data Structures and Algorithms in C++, Thomson Learning (Vikas Publishing House) New Delhi – 2001.
3. John R. Hubbard – Data Structures with C++, Tata McGraw Hill, New Delhi, 2004

CH 2103	ENVIRONMENTAL SCIENCE	1.0

MODULE– I

Environmental Awareness: Multidisciplinary nature of environmental Science, Definition, scope , importance and need for public awareness.

(2)

MODULE– II

Ecology and Environment: concept of an ecosystem ,structure and function of an ecosystem, producer ,consumer and decomposer, energy and nutrient flow biogeochemical cycles, food chain ,food web, ecological pyramid.

(3)

MODULE– III

Environmental Pollution : Segments of environment, sources, pathways and fate of environmental pollutants, causes of environmental pollution , physical ,chemical and biological transformation of pollutants , population explosion, environment and human health, human rights, value education ,women and child welfare.

(5)

MODULE– IV

Air Pollution: various segments of atmosphere and their significance,classification of air pollutants, toxic effects, sampling and analysis, stationary and mobile emission, sources and their control, photochemical smog ,sulphurous smog, green house effect, global warming, ozone depletion, Air (prevention and control of pollution) Act.

(10)

MODULE– V

Water Pollution: Water resources ,sources of water pollution ,various pollutants, their toxic effect, potability of water , municipal water supply , disinfection, characteristics of waste water, primary and secondary waste water treatment, BOD and COD measurement and their significance ,rain water harvesting ,water shed management,Water (pollution and control) Act.

(12)

MODULE– VI

Natural Resources and Biodiversity: Renewable and non renewable resources, Forest resource, consequences of deforestation, floods and draughts, equitable use of resources for sustainable development, Dams benefits and problems, Biodiversity: ecosystem diversity , threats to biodiversity, conservation of biodiversity**.**

(4)

MODULE– VII

A brief introduction to Noise Pollution, Soil Pollution, Solid Waste Management.

(4)

Books Recommended:

1. Sharma and Kaur, Environmental Pollution
2. De, Environment Chemistry

MODULE – I

Special Theory Of Relativity

Postulates, Galilean transformations, Lorentz transformations, length contraction, time dilation, velocity addition, mass change and Einstein's mass energy relation. (AB: 1.1,1.2,1.4,1.7,1.8,1.9, and Appendix to chapter-1

[6]

MODULE – II

Quantum Mechanics:

Planck's theory of black-body radiation (AB: 2.2, 9.5, 9.6), Compton effect (AB: 2.7), wave particle duality, De Broglie waves, Davisson and Germer's experiment(AB:2.4, 3.1, 3.2, 3.3, 3.4, 3.5), uncertainty principle(AB:3.7,3.8,3.9), physical interpretation of wave function and its normalization(AB:3.2), expectation value(AB:5.4).

[8]

Schrodinger equation in one dimension(AB:5.2), solutions of time-independent Schrodinger equation for free particle(AB:3.6, 5.5, 5.6), particle in an infinite square well, potential barrier and tunneling(AB:5.7, 5.8), hydrogen atom (qualitative)(HRW:40-8).

[8]

MODULE – III

Statistical Physics And Thermodynamics:

Elementary ideas, comparison of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (AB: 9.1, 9.2, 9.3, 9.4).

[4]

Zeroth law, first law, second law, entropy, heat transfer, steady state one-dimensional heat conduction [(HRW:19-2, 19-9, 21-3, 19-11),(SS:14.2, 14.7)].

[6]

MODULE – IV

Lasers And Applications:

Emission of light by atoms, spontaneous and stimulated emission (AB: 4.9, and AG: 23.1), Einstein's A and B coefficients, laser: population-inversion (AG: 23.4), properties of laser radiation, Ruby & He-Ne lasers, applications of lasers (AB: 4.9) and AG: 23.1), elementary ideas of holography (AG: 18.1) and fiber optics (AG: 24.1-24.3).

[8]

MODULE – IV

Nuclear Physics:

Nuclear forces, binding energy, liquid drop model (AB: 11.1-11.6), fission, nuclear reactors, fusion, energy processes in stars, controlled thermonuclear reactions (AB: 12.9-12.12).

[5]

Text Books:

1. Arthur Beiser, Concepts of Modern Physics, 5th edition, Tata McGraw Hill, 1997.
2. Ajoy Ghatak, Optics, 2nd edition, Tata McGraw Hill, 1997.

Reference Books:

1. Jasprit Singh, Modern Physics for Engineers, John Wiley & Sons, 1999.
2. Kenneth Krane, Modern Physics, 2nd edition, John Wiley & Sons, 1998.
3. Wehr, Richards and Adair, Physics of the Atom, 4th edition, Addison Wesley.

THIRD SEMESTER

MA3101	Mathematics III	1.0

Special Functions:
Bessel's equation: solution and Bessel's function of the first kind, Recurrence relations. Orthogonality of Bessel's Functions. Generating function and Bessel's integral. Legendre's equation: solution and Legendre's polynomials, Rodrigue's Formula. Orthogonarity relations. Generating function and recurrence relation. Definition of Hankekl's function. Elliptic Integral of the first and second kind. Jacobi's form of elliptic integrals.

(8L)

Complex Variables:
Continuity, differentiability and analyticity of a function of a complex variable, Cauchy Riemann differential equations in Cartesian and polar forms. Harmonic functions, Bilinear and conformal transformations. Complex integration, Cauchy's integral theorem and formula. Derivatives. Taylor's and Laurent's Series. Poles and Singularities. Cauchy's Residue Theorem. Contour integration (Poles on real axis excluded)

(13L)

Partial differential equations:
Formation of partial differential equations. Lagrange's first order linear equations. Non linear equations. Higher order differential equations with constant Co-efficients. Non homogeneous equations: solution by separation of variables. Boundary value Problems. wave equation in one dimension and its solution. Derivation of one dimensional heat equation and its solution.

(10L)

Fourier Series and Fourier Transform:
Periodic functions Existence conditions Euler's formulae. Half range series. Fourier series of functions with arbitrary period.
Fourier Integral Formula, Fourier Transform, Inversion Theorem, Fourier sine and cosine transforms and inversion formulae, Linearity property, Convolution or Faltung theorem. Relationship between Fourier and Laplace transform. Finite Fourier Transforms. Heaviside, Unit step function and Dirac Delta Function

(10L)

Statistics:
Mean and variance. Moments. Concept of Random variable. Probability density and Distribution functions Problems, Elements of error analysis

(4L)

Books Recommended:

1. Engineering Mathematics – E. Kreyszig
2. Advanced Engineering Mathematics – C. Prasad
3. Fourier Transforms – I.N. Sneddon

MODULE – I

Introduction to PN junction diodes, Characteristics of semiconductor diodes, Analysis of simple diode circuits: DC and AC load lines, Zener diode, Characteristics and applications in regulators.

(4)

Text Book:

1. "Integrated Electronics" Millman & Halkias, McGraw Hill.

MODULE – II

Application of diodes, Rectifiers: Half wave rectifier, Full wave rectifier with π filter.
Clipping and clamping circuits: Elementary diode clippers, Transfer function characteristic, Clipping at two independent levels using diodes and Zener diodes, Operation of an elementary clamping circuit.

(6)

Text Book:

1. "Electronics Devices & Circuits" Millman & Halkias, McGraw Hill.

MODULE – III

Fundamentals of transistors: Introduction to transistor circuits for CB, CE, CC configurations. Transistor biasing and bias stability. JFET & MOSFET, characteristics, biasing and small signal low frequency analysis of CD, CS configurations, FET as VVR,

(6)

Text Book:

1. "Electronics Devices & Circuits" Millman & Halkias, McGraw Hill.
2. "Integrated Electronics" Millman & Halkias, McGraw Hill.

MODULE – IV

Small signal low frequency analysis of CE, CB and CC amplifiers.

(6)

Text Book:

1. "Integrated Electronics" Millman & Halkias, McGraw Hill.

MODULE – V

Transistor Power Amplifiers: Circuits and Operations of Class A, Class B, Class C and Push-Pull Configurations.

(6)

Text Book:

1. "Electronics Devices & Circuits" Millman & Halkias, McGraw Hill.

MODULE – VI

Logic circuit implementation of Boolean expressions, Adder, Subtracter, Seven-segment Display, Basic concept of TTL & CMOS logic system, Flip-flops.

(5)

Text Book:

1. Electronics Fundamentals and Applications", D. Chattopadhay & P. C. Rakshit, New Age International, 5/E

MODULE – VII

Operational amplifiers and its applications: Characteristics, Parameters, Measurements, Emitter Coupled Differential Amplifier, Transfer Characteristics, Voltage gain, Input and Output impedance of Inverting and Non-inverting amplifiers using OP-AMP, Linear and Non-linear applications of OP-AMP: Voltage follower, Phase inverter, Scale changer, Integrator, Differentiator.

(12)

Text Book:

1. "Integrated Electronics" Millman & Halkias, McGraw Hill.

Reference Books:

1. "Microelectronic Circuits", Sedar and Smith.
2. "Operational Amplifiers and Linear Integrated Circuits" by R. A. Gayakwad, PHI.
3. "Electronic Devices and Circuit Theory", Nashelesky & Boylestead, PHI.
4. "Linear Integrated Circuit", S. Jain & D. Roychoudhury, New Age International.
5. "Electronics Fundamentals and Applications", D. Chattopadhay & P. C. Rakshit, New Age International.
6. "Electronic Devices and Circuits", Allan Mottershed, PHI.

EE 3101	INTRODUCTION TO SYSTEM THEORY	1.0

MODULE – I

Introduction to signals and systems: Definition, Basis of classification, Representation of common signals and their properties, System modeling.

(4)

MODULE – II

Analogous System: Introduction, D Alembert's Principle, Force-voltage and force-current analogies, Electrical analogue of mechanical, Hydraulic and thermal systems.

(5)

MODULE – III

Fourier Transform Method: Introduction, Fourier transform pair, Amplitude spectrum and phase spectrum of signals, Sinusoidal transfer function.

(3)

MODULE – IV

Laplace Transform Method: Introduction, Laplace transform pair, Laplace transformation of common functions, Gate function, Step function and impulse function, Laplace theorems shifting, initial value, final value and convolution theorems.
Inverse Laplace transform by partial fraction expansion and convolution integral method.

(12)

MODULE – V

System Analysis: System Analysis by Laplace Transform method, System response. Natural, forced, transient and steady state responses. Transfer function and characteristic equation, Superposition integral, Concept of poles and zeros, Nature of system response from poles and zeros.

(6)

MODULE – VI

System Stability: Concept of stability, Types, Necessary and sufficient conditions, Routh Hurwitz stability criterion, Limitations and its applications to closed loop systems.

(4)

MODULE – VII

State-Space Concept: Introduction, Definition: State, State variable, State vector and state space, State space representation, Derivation of State model from transfer function, Bush form and diagonal canonical form of state model, Non-uniqueness of state model, Derivation of transfer function from state model, Transition matrix and its properties, Solution of time invariant state equation.

(6)

Text Books:

1. Analysis of Linear Systems – D.K.Cheng.
2. Control System Engineering – Nagrath & Gopal
3. Control System – A. Anand Kumar

Reference Books

1. Networks and Systems – D. Roy Choudhury
2. Signals and Systems - Basu & Natarajan

MODULE – I

Thermodynamic System, control volume, intensive and extensive properties. Zeroth Law of Thermodynamics, Concept of temperature, Heat and work. Thermodynamic properties of pure substances. Thermodynamic property table and charts.

(5 Lectures)

MODULE – II

First law of Thermodynamics, Energy and its forms. Enthalpy, specific heats. First law applied to flow Non-flow and steady processes.

(4 Lectures)

Second law of Thermodynamics, Kelvin-Plank and Clausius Statements, reversible and irreversible process, Thermodynamic (absolute) temperature scale.

(4 Lectures)

MODULE –III

Entropy: Inequality of Clausius and concept of Entropy. Entropy change of a system and control volume. Carnot cycle, Otto cycle, Diesel cycle.

(6 Lectures)

MODULE –IV

Classification and brief description of Low and High Pressure boilers; mountings and accessories; draught and performance of boilers.

(5 Lectures)

MODULE – V

Basic concepts of Conduction, convection and Radiation; one dimensional steady state conduction. Application to composite walls and cylinders, Critical thickness of insulation.

(7 Lectures)

MODULE – VI

Simple stresses and strains, Bending moment and shear force diagrams graphical representation of stress and strains, strain rosettes.

(5 Lectures)

MODULE- VII

Linear single degree of freedom system, free system with damping Balancing of revolving masses in a plane and in different planes.

(9 Lectures)

Books:

1. Fundamentals of Classical Thermodynamics – G.J. Van Wylen and R.E. Sorntag, Second Edition, Wiley Eastern (1984).
2. An Introduction to Thermodynamics – P.K. Nag
3. Thermal Engineering – R.K. Rajput
4. Strength of Materials – F.L. Singer
5. Theory of Machines – Thomas Beven

MODULE – I

Introduction To Crystallography:

Crystal structures, Space lattice, Symmetry elements, Unit cells, Crystal systems, Packing factors, Miller indices, Single crystals, Polycrystalline materials (WDC 3.1-3.14). Distance between parallel planes, X-ray diffraction & Bragg's law, Laue method, Power Method (WFS 3.11).

[5]

MODULE – II

Imperfections And Strengthening Mechanism In Solids:

Types of imperfections, Point defects (WDC 4.1-4.3). Dislocations: Edge dislocation & Screw dislocation, Burger's vector, Concepts of dislocation density (WDC 4.5), Surface defects (WDC 4.6), Volume defects (WDC 4.7), vibrational defects (WDC 4.8).

[4]

MODULE – II

Phase Rules:

Phases (WDC 9.3), Phase Equilibria, Single component systems (WDC 9.5). Binary phase diagrams(WDC 9.6), Microstructural changes during cooling, The Lever rule and its applications (WFS 8.4), Gibbs phase rule (WDC 9.7-9.8, WFS 8.2). Glass transition (WDC 13.8).

[4]

MODULE – III

Mechanical Properties:

Engineering stress, Engineering strain, stress-strain behaviour, Elastic deformation (WFS 6.2, 6.3). Atomic view of elasticity, Anelasticity, Slip, Slip systems (WDC 7.4), Resolved shear stress (WDC 7.5), Plastic deformation of single and polycrystalline materials (WDC 7.6, WFS 6.5), Strain hardening (WDC 7.10). Recovery (WDC 7.11), Recrystallization, Cold working & Hot working (WDC 7.12, WFS 6.8). Grain Growth (WDC 7.13), Introduction to Fracture, Fatigue and Creep (WDC 8.2.-8.16, WFS 6.11).

[8]

MODULE – IV

Electrical And Magnetic Properties:

Basic concepts and types of polarization, A.C. effects, Ferro-electricity, Piezo electricity, Ferro and piezo electric materials (WDC 18.24-18.25).

Free electron theory of metals, Band theory of solids, Intrinsic, Extrinsic & compound semiconductor, conductivity, mobility, Temperature dependence of conductivity & carrier concentration (WDC 18.1 – 18.13). Superconductors: elementary introduction, High T_C superconductors (WDC 20.11).

Dia, Para and Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Influence of temperature, Magnetic domains & hysteresis, Magnetic materials, Magnetic storage devices, Memory materials (WDC 20.1 -20.10).

[10]

MODULE – VI

Ceramic, Glasses, Polymers And Composites:

Common Refractory: Materials, Portland cement composition and its grades (WDC 16.2).

Glasses: Types of glasses, Glass ceramics (WFS 10.9)

Polymers: Polymer classification and properties, Polymer applications, Cable, Insulation, Optical Fibre (WDC 14.1-14.4, 15.2-15.5, 15.10-15.13). Smart polymers for electrical and electronic applications, Conducting polymers (WDC 18.17).

Composites: Fibre reinforced composites (WFS 13.3), Influence of fibre length & orientation (WDC 16.4), Whiskers, Various fibre reinforced composites, plastic and glass fibers (WDC 16.6).

[10]

MODULE – VII

Introduction To Nanotechnology:

Basic concepts of nanotechnology, Nanomaterials: Fabrications & Applications. [**Nanotechnology:** M Ratner & D. Ratner (Pearson Education Publication)]

[4]

Texts Books:

1. W. D. Callister, Materials Science and Engineering: An Introduction, John Wiley, 6th Edition, 2003. [WDC]
2. W. F. Smith, Principles of Materials Science and Engineering, McGraw Hill International, 1986. [WFS].

References:

1. The Structure and Properties of Materials, Vol. –I,
2. Mofatt, Pearsall and Wulf, Vol. –III ,
3. Hayden , Mofatt and Wulf, Vol. –IV,
4. Pease, Rose and Wulf, Wiley Eastern. (2)
5. Physical Properties of Materials, M. C. Lovell, A. J. Avery, M. W. Vernon, ELBS.

EE 3103	ELECTRIC ENERGY GENERATION AND CONTROL	1.0

MODULE – I

Introduction: Overview of power generation scenario from thermal, hydro and nuclear and non-conventional sources.

(2)

MODULE – II

Thermal Stations: Selection of site for a thermal station, layout, main components, boiler, economizer, air preheater, super heater, reheater, condenser, feed heater, cooling powers, FD and ID fans, Coal handling plant, water treatment plant, Ash handling plant, Types of boilers and theirs characteristics, Steam turbines, and their characteristics, governing system for thermal stations.

(15)

MODULE – III

Hydro Electric Stations: Selection of site, layout, classification of hydro plants, general arrangement and operation of a hydro-plant, governing system for hydel plant, types of turbines.

(5)

MODULE – IV

Nuclear Power Station: Nuclear reaction for nuclear power, nuclear fuels, feasibility of a nuclear power station, layout, main part of a nuclear station, nuclear reactor classification, control system for nuclear power station, Safety of nuclear power reactor.

(5)

MODULE – V

Diesel Electric Station: Site selection, layout, main components, choice and characteristics of diesel engines, diesel engines, diesel plant efficiency and heatbalance, maintenance.

(5)

MODULE – VI

Gas Turbine Plant: Plant layout, a simple gas turbine plant, methods to improve thermal efficiency of a gas turbine plant, fuel for gas turbine plant, combined gas turbine cycle, advantages of gas turbine plants over steam plants.

(5)

MODULE – VII

Non-conventional Sources of Energy and Economics of Power Generation: Wind, Tidal, Solar, and Load curve, Load factor, diversity factor, Plant capacity factor, Plant utilization factor, different types of tariffs, Inter connection of power system.

(8)

Text Books:

1. Power Plant Engineering- PK Nag TMH publications
2. A Textbook on Power System Engg. – A Chakravarti, ML Soni, PV Gupta and U.S. Bhatnagar, Dhanpat Rai & Co., New Delhi

Reference Books:

1. Elements of Electrical Power Station Design – MV Deshpande, Pitman and Sons Ltd.
2. Electric Power Generation, Transmission and Distribution - S.M. Singh, Prentice Hall of India, Delhi.
3. Generation, Distribution and Utilization of Electrical Power – C.L. Wadhwa

FOURTH SEMESTER

EE 4101	DC MACHINES AND TRANSFORMER	1.0

MODULE – I

Basic Concepts of Electrical machines: Introduction, Electromagnetic induction, flux linkage, Statistically and dynamically induced emf, Classification and description of electrical machines, Heating and cooling of electrical machines.

(5)

MODULE – II

Elements of Rotating Machines: Introduction, Basic Components, Rotor, Stator and field excitation. Generator and motor action, EMF and torque equations, Leakage flux, Losses and efficiency, Rating and loss dissipation, Electrical and mechanical degrees.

(4)

MODULE – III

Introduction to D.C. Machines: Constructional parts of d.c. machines and their function, Principle of operation, Armature winding- Lap and wave, Simplex and duplex, Method of excitation, Classification, Derivation of emf and torque equations, Process of commutation, Armature reaction, Interpoles, Compensating winding and equalizer rings.

(8)

MODULE – IV

DC Generators: Operating Characteristics- Magnetization, Internal and external characteristics, Critical resistance and critical speed, Process of building up of voltage, Causes of failure of voltage build-up and remedies, Parallel operation of d.c. generators, Applications.

(7)

MODULE – V

D.C. Motors: Basic equation for voltage, Power, Torque and speed, Condition for maximum power, Operating characteristics- Torque-current, Speed-current and Torque-speed characteristics. Comparison, Starters, Speed control methods, Testing of d.c. machines- Swinburn's, Hopkinson's and Series field tests. Calculation of efficiency, Applications.

(7)

MODULE – VI

Transformers: Principle of operation, Construction and practical considerations, Ideal and physical transformer, emf equation, transformation ratio, Phasor diagram. Performance analysis, Equivalent circuit, Losses and efficiency, Condition for maximum efficiency, Determination of equivalent circuit parameters by O.C. and S.C. tests, Per unit calculation, Polarity test, Voltage regulation, all day efficiency.

(8)

MODULE – VII

Transformer Connections and Operation: Back-to-back test, Parallel operation, Autotransformer, 3-phase transformer, Three-phase transformer connections- Star-star, Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection, Transformer cooling.

(6)

Text books:

1. Electric Machinery - Fitzgerald
2. Performance and Design of DC Machines - A.E. Clayton

Reference books:

1. Electrical Machines – Bimbhra, Khanna Publishers, Delhi
2. Parker Smith's - Series in Electrical Engineering.
3. Electrical Machines - Nagrath & Kothari, TMS Delhi

EE 4103	ELECTRICAL MEASUREMENT	1.0

MODULE – I

Introduction: Definition of measurement, Accuracy, Precision, Types of error, Statistical analysis, Systems of units, Fundamental units, Electrical derived units, Dimensions, Standards of measurement, International standards, Organizations, ISI.

(7)

MODULE – II

Analog instruments: Basic requirement of a measuring instrument, Construction and principle of Moving coil, Moving iron, Induction types of instruments, Range extension including current and potential transformers.

(8)

MODULE – III

Measurement: Measurement of voltage, current, power, energy, frequency, power factor, phase and localization of cable fault.

(6)

MODULE – IV

Introduction to D'Arsonval, Vibration and ballistic galvanometer, Construction, Torque equation, Intrinsic constants and equation of motion.

(6)

MODULE – V

Bridge: DC bridges for measurement of resistance Wheatston bridges, Kelvin's double bridges and AC bridges for measurement of L, R, C & M, Maxwell's bridges, Anderson's bridges, Weins bridges.

(7)

MODULE – VI

Potentiometers: DC and AC potentiometers, Principles, Standardization and application.

(5)

MODULE – VII

Magnetic Measurement: DC and AC testing of magnetic materials and permeameter.

(6)

Text Book:

1. Sawhney A.K. - Electrical & Electronic Measurement and Instrumentation.
2. Helfrick and Copper - Modern Electronics Instrumentation and Measurement, Pearson Education, New Delhi.

Reference Book:

1. Deoblin - Electrical Measurement.
2. Patranabis D – Sensors and Transducers, Wheeler, 1996.
3. Patranabis D – Principles of Industrial Instrumentation, TMH Publication, New Delhi, 1976.

MODULE – I

RC Filters: RC low pass and high pass filters and their response to sinusoidal, step, pulse, square wave and ramp inputs.

(5)

MODULE – II

Transistors at high frequencies: Hybrid π model, Amplifier response at high frequencies, Gain Bandwidth product, FET at high frequencies.

(5)

MODULE – III

Low frequency response of RC coupled stage and Multistage amplifiers, Tuned amplifier, Cascode Video amplifiers.

(6)

MODULE – IV

Feedback amplifiers: Classification of amplifiers, Votlage series, Voltage shunt, Current series, Current shunt feedback.

(12)

MODULE – V

Oscillators: Barkhausen criterion, Phase shift and Wein bridge oscillators, Hartley and Colpitt's Oscillators, Crystal Oscillators, Frequency stability.

(5)

MODULE – VI

Voltage and current time base generators: Exponential sweep, UJT as a negative resistances switch in sawtooth generators, Miller and Bootstrap time base generators, A simple current sweep, Linearity correction through adjustment of driving waveforms, A transistor current time-base generator.

(6)

MODULE – VII

A/D and D/A Converters: D/A converters – Binary Weighted D/A Converter, Ladder type D/A converters, Specifications for D/A Converters A/D Converters – Simultaneous A/D converter, Counter type A/D converter, Successive approximation type A/D converter, Dual slope converter, Comparison of converter types.

(6)

Text books:

1. Integrated Electronics. Millman & Halkias, McGraw Hill.
2. Pulse Digital and Switching Waveforms. Millman & Taub, TMH.
3. 'Digital Integrated Electronics' Taub & Schilling, TMH.

Reference Book:

1. Electronics Circuits : Discrete and Integrated, D. Schilling and C. Belove, McGraw ill.
2. Modern Digital Electroncis, R. P. Jain, TMH
3. Digital Principles & Application, Malvino & Leach, TMH.

MODULE – I

Simplification of Boolean Expressions: Karnaugh map, Quine McCluskey method.

(5)

MODULE – II

Design of Combinational Circuits: Adders, Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Parity Generators and Checkers, Signed number system, BCD adder/subtractor.

(6)

MODULE – III

Introduction to various logic families: TTL gates, CMOS gates, Static CMOS Design; Ratioed Logic, Pass-transistor logic, Transmission gate logic, Dynamic CMOS Design, Cascading dynamic gates, Domino Logic.

(10)

MODULE – IV

Sequential circuits: Basic Concepts, Flip-Flop, Analysis of RS, JK, Master Slaves, T and D Flip-Flop, Controlled Registers, Registers and their applications, Synchronous and asynchronous counters, Controlled Counters, Up/Down counters, Ring counter Design of an 8x4 ROM, Design of sequential circuits from state diagram, Dynamic Latches & Registers using CMOS and C^2MOS .

(12)

MODULE – V

Multivibrators: Types of multivibrators, Self bias bistable multivibrators, Schmiff Trigger, Commutating Capacitors, AMV and MMV using 555 timer and CMOS/TTL circuits, Negative resistance characteristics of Multivibrators.

(4)

MODULE – VI

Introduction to programmable Logic Devices: PLA, PAL, Up/down counter using PAL, Generic array logic, EPLD, FPGA, Xilinx FPGA, Actel FPGA.

(4)

MODULE – VII

Memories: Read only memories, PROMs, EROMs, EEPROMs, RAMs: Static RAM, Dynamic RAM, Magnetic memories, CD-ROM, Flash memories.

(4)

Text Book:

1. R.P. Jain, Modern Digital Electronics, TMH, Delhi
2. Malvino, Digital Computer Electronics, TMH

Reference Books:

1. Digital Logic and Design, M. Mano. PHI
2. Digital Integrated Circuit - A Design Perspective, Prabeen, Chandrakasan, Nikolic & Pearson Education.
3. Digital Integrated Circuit - A Design Perspective, Prabeen, Chandrakasan, Nikolic & Pearson Education.
4. Digital Logic Application and Design, J. M. Yarborough, Thomson.

MODULE – I

Network Theorem: Substitution theorem, Tellegen's theorem, Reciprocity theorem.

(3)

MODULE – II

Network Topology: Definition and properties, Matrices of Graph, Network Equations & Solutions : Node and Mesh transformation, Generalized element, Source transformation, Formulation of network equations, Network with controlled sources, Transform networks, Properties of network matrices, Solution of equations. Linear time-invariant networks, Evaluation of initial conditions, Frequency and impedance scaling.

(10)

MODULE – III

Multi-terminal Networks: Natural frequency, Network functions, Two-port parameters, Equivalent networks.

(6)

MODULE – IV

Elements of Network Synthesis: Positive real function, Reactance functions, RC functions, RL Network, Two-port functions, Minimum phase networks.

(7)

MODULE – V

Approximation: Filter specifications, Butterworth approximation, Chebyshev approximation, Comparison between Butterworth and chebyshev transfer functions.

(6)

MODULE – VI

Bandpass filter approximation, Frequency transformation, Insertion Loss Synthesis: Co-efficient matching technique, Darlington's method.

(6)

MODULE – VII

Active networks and filters: Active elements, Single amplifier filters, State variable realization, All pass and notch filter, Higher order filter.

(7)

Text Book:

1. V.K. Aatre, Network Theory & Filter Design

Reference Book:

1. M.E. Van Valkenberg, Introduction to Modern Network Synthesis
2. Balabanian, N. and T.A. Bickart, “Electric Network Theory”, John Wiley & Sons, New York, 1969.
3. C. L. Wadhwa, Network Analysis and Synthesis

MODULE – I

High Speed Computation: Introduction, Computer arithmetic, errors, machine computation.

MODULE – II

Transcendental and Polynomial Equations: Introduction, Bisection method, Iterative Methods, Rate of Convergence, Methods for complex roots, Polynomial equations.

MODULE – III

System of Linear Algebraic Equations and Eigenvalue Problems: Introduction, Direct methods, Error analysis, Iteration methods, Eigenvalues and Eigen Vectors.

MODULE – IV

Interpolation and Approximation: Introduction to Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomial using finite differences, Hermite interpolations, piecewise and spline interpolation.

MODULE – V

Differentiation and Integration: Introduction, Numerical differentiation, Optimum choice of step-length extrapolation methods, numerical integration, methods based on interpolation and undetermined coefficients, romberg integration.

MODULE – VI

Ordinary Differential Equations: Introduction, Numerical method, Single and Multistep methods, Predictor-corrector methods and finite difference methods.

Text Books:

1. Jain,M.K., etal : Numerical Methods for Scientific and Engineering Computation, 3rd Ed. New Age Publication, New Delhi, 1999

Reference Books:

1. Sastry .S.S., “Introductory Method of Numerical Analysis”, PHI, 2nd Ed., 1999.
2. Rajaraman V., “Computer Oriented Numerical Method”, PHI, 2nd Ed.,

FIFTH SEMESTER

EE 5101	AC ROTATING MACHINES	1.0

MODULE – I

Basic Concept of A.C. Rotating Machines: Introduction to Armature winding, Integral slot and fractional slot winding, Distribution factor (Kd), Pitch factor (Kp) and winding factor (Kw). Production of rotating magnetic field, EMF and torque equations, Effect of tooth harmonics and methods of reduction.

(4)

MODULE – II

Synchronous Generator: Construction, Cylindrical rotor and salient pole rotor, Principle of operation, Excitation system, Effect of winding factor on EMF, Armature reaction, Circuit model, Phasor diagram, O.C. and S.C. tests, Short-circuit ratio, Determination of voltage regulation by synchronous impedance, MMF and zero power factor methods.

(8)

MODULE – III

Performance Characteristics of Synchronous Generator: Two reaction theory, Phasor diagram, Power-angle characteristic of synchronous generators, Synchronizing power and torque, Synchronizing methods, Parallel operation of synchronous generator, Effect of change in excitation and mechanical power input on load sharing, Operation of alternator on infinite bus bars, Slip test.

(7)

MODULE – IV

Synchronous Motor: Construction, Principle of operation, Equivalent circuit, Phasor diagram, Circuit model, Effect of change in excitation on armature current and power factor, Starting of synchronous motor, Synchronous condenser, Hunting, Applications.

(7)

MODULE – V

3-ϕ Induction Motor : Introduction, Construction, Principle of operation, Slip and rotor frequency, Comparison with transformer, Equivalent circuit model, Representation of mechanical load, No load and blocked rotor tests. Torque and power output, Losses and efficiency, Separation of losses.

(7)

MODULE – VI

Performance Characteristics of 3-phase Induction Motor: Circle Diagram, Torque-slip characteristics, Effect of rotor resistance, Starting torque and maximum torque, Starting and speed control methods, Cogging and crawling, Introduction to induction generator, Applications.

(7)

MODULE –VII

Single-phase Induction Motor: Introduction, Double revolving field theory, Crossfield theory, Torque-speed characteristic, Equivalent circuit model, Starting methods, Applications.

(5)

Text Book:

1. A.S. Langsdorf, Alternating Current Machines
2. A.E. Fitzgerald, Electric Machinery

Reference Books:

1. P. S. Bimbhra, Electrical Machines, Khanna Publishers
2. I. J. Nagrath, D.P. Kothari, Electric Machines, TMH, New Delhi, 2002.
3. P. K. Mukherjee, S. Chakravarti, Electrical Machines, Dhanpat Rai & Sons.

EE 5103 ELECTRIC POWER TRANSMISSION AND-DISTRIBUTION 1.0

MODULE – I

Introduction: Structure of a power system, Effect of Transmission voltage, Load factor, diversity factor, plant capacity factor, plant utilisation factor, different types of tarriffs.

(7)

MODULE – II

Constants of O/H lines: Inductance and capacitance of overhead lines: Inductance and Capacitance of single phase and three phase line, Transposition, Double ckt. three phase lines.

(6)

MODULE – III

Over head line insulators, Under-ground cables.

(6)

MODULE – IV

Mechanical design of transmission line, Corona

(6)

MODULE – V

Distribution Systems: Feeders, distributors, and service mains, types of distribution systems, Kelvin's law for design of feeders, Economics of distribution systems

(8)

MODULE – VI

Transmission System: Representation of short, medium and long transmission lines, Ferranti effect, SIL, Tuned Power Line, Power flow through transmission lines.

(8)

MODULE – VII

Basic Ideas of Voltage Control

(4)

Text Books:

1. Stevenson, Elements of Power System Analysis
2. Nagrath – Kothari, Modern Power System Analysis

Reference Books:

1. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Power
2. C. L. Wadhwa, Electrical Power Systems
3. B. R. Gupta, Power System Analysis

MODULE – I

Electrostatic and Magnetostatic Energy, Forces and Torques: Electrostatic energy. Electrostatic forces and torques in terms of stored electrostatic energy. (Chapter 3, pp. 133-143)

Magnetic energy. Magnetic forces and torques in terms of stored magnetic energy. (Chapter 6, pp. 277-281, pp. 289-294).

(6)

MODULE – II

Electrostatic Boundary-Value Problems: Introduction. Poisson's and Laplace's equations. Boundary conditions. Uniqueness theorem. Solution of one-dimensional Laplace's and Poisson's equations. Solution of two-dimensional Laplace's equation by method of separation of variables in cartesian, cylindrical and spherical coordinates. (Chapter 4, pp. 152-159, pp. 174-192)

(8)

MODULE – III

Plane Electromagnetic Waves: Wave equations. Helmholtz equations. Plane waves. Propagation of uniform plane waves in dielectric and conducting media. Polarization of plane waves. (Chapter 8, pp. 354-379)

(8)

MODULE – IV

Reflection and Refraction of Plane Waves: Electromagnetic boundary conditions. Reflection of normally and obliquely incident plane waves from perfect conductor and dielectric. Total reflection. Total transmission. (Chapter 8, pp. 386-401, pp. 406-417)

(6)

MODULE – V

Rectangular Waveguides and Cavity Resonators: Introduction. General wave behaviors along uniform guiding structures. TEM, TM and TE waves. Rectangular waveguides. Rectangular cavity resonators. (Chapter 10, pp. 520-533, pp. 547-558, pp. 582-588).

(8)

MODULE – VI

Radiation and Antennas: Introduction. Scalar and vector potentials. Retarded potentials. Radiation from elemental electric dipole. Antenna pattern and antenna parameters. Thin linear antennas. Half-wave dipole. Effective antenna length. Antenna arrays. Two-element arrays. (Chapter 11, pp. 600-605, pp. 607-625)

(6)

MODULE – VII

Solution of Two-dimensional Problems: Method of images (Chapter 4, pp. 159-174). Conformal transformations (Ref. Class notes)

(5)

Text Book:

1. Cheng, D.K., “Field and Wave Electromagnatics”, Pearson Education (Singapore) Pte. Ltd., 2nd Edn., 1989.
2. Hayt, W.H., J.A. Buck, “Engineering Electromagnetics”, Tata Mc Graw Hill.

MODULE – I

Introduction: Discrete-Time Signals, Shanon's sampling theorem, Difference equation description, characteristics of digital filters and time domain analysis, properties of discrete time system (linearity, time-variance, convolution), BIBO stability, Z-transformation and their application in solving difference equations, Relationship between Laplace and Z-transforms.

(7)

MODULE – II

Frequency domain analysis: Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT), Periodic convolution, Direct evaluation of DFT, FFT algorithms-decimation in time and frequency, Relationship between Fourier and Z-transforms

(8)

MODULE – III

Digital Filter Structures: Direct form I&II, cascade, parallel and ladder realizations.

(5)

MODULE – IV

Filter Function Approximations and Transformations.

Review of approximations of ideal analog filter response, Butterworth filter, Chebyshev Type I & II.

(6)

MODULE – V

Frequency Transformations: Frequency transformation in analog domain, frequency transformation in digital domain.

(4)

MODULE – VI

Design of IIR Filter: Design based on analog filter approximations, Impulse invariance method, Matched Z-transformation, Bilinear transformation.

(7)

MODULE – VII

Design of FIR filters: Symmetric and antisymmetric FIR filters, design of linear phase FIR filters using windows and frequency – sampling methods, design of optimum equiripple linear phase FIR filters, comparison of FIR and IIR filters.

(8)

Text Books:

1. John G. Proakis, Dimitris G. Mamalakis, Digital Signal Processing, Principles, Algorithms and Applications
2. Alan V. Oppenheim Ronald W. Schafer, Digital Signal Processing, PHI, India.

Reference Book:

1. Antonious, Digital Filter Design, Mc-Graw-Hill International Editions.

MODULE – I

Oscilloscopes: CRT, Construction, Basic CRO circuits, Block diagram of a modern oscilloscope, Y-amplifiers, X-amplifiers, Time base-single and mixed time base. Triggering, Oscilloscopic measurement

(8)

MODULE – II

Special purpose CRO's: Dual trace, Duel beam, Sampling oscilloscope, Analog and digital storage CROs.

(5)

MODULE – III

Electronic instruments: Electronic voltmeter, Digital voltmeter, vector voltmeter, Vector Impedance meter and Q-meter.

(6)

MODULE – IV

Transducers: Classification, Inductive, Resistive and Capacitive transducers, Analog and Digital Transducers with applications. Hall effect, Piezo Electric, Photovoltaic transducer, Measurement of temperature and pressure

(9)

MODULE – V

Display Devices & Recorders: Digital display, LED, LCD, Strip chart recorder, X-Y recorder, Magnetic type recorder.

(6)

MODULE – VI

Signal Generation: Sine wave generator, Triangular wave and square wave generator.

Signal Analysis: Wave analyzer, Frequency selective and hetrodyne wave analyzer. Distortion measurement, Harmonic analyzer

(7)

MODULE – VII

Data Acquisition System: Introduction to Telemetry, Optoelectronics based measurement

(4)

Text Books:

1. Sawhney A.K. - Electrical & Electronic Measurement and Instrumentation.
2. Helfrick and Copper - Modern Electronics Instrumentation and Measurement, Pearson Education, New Delhi.

Reference Book:

1. Patranabis D – Sensors and Transducers, Wheeler, 1996.
2. Kalsi - Electronics Instrumentation, TMH Publication, New Delhi

MODULE – I

Digital computer, Computer languages, Main frame, Mini computers, Microcomputers, Architecture of 8085 microprocessor, Functions of different pins, Bus Concept.

(5)

MODULE – II

Memory organization, Memory map, Interfacing devices, Memory interfacing, Different machine cycles

(5)

MODULE – III

Instruction set, Instruction classification, Instruction format, Addressing modes of 8085, Simple illustrative programs and flow chart, System timing diagram.

(7)

MODULE – IV

Programming techniques, Looping, Counting, Logic operations, Sorting, Counter and time delays, Stack and subroutine, Code conversion BCD to binary, Binary to BCD, Binary to ASCII and ASCII to Binary, BCD Arithmetic.

(6)

MODULE – V

Data transfer schemes, Memory mapped I/O and I/O mapping, I/O port Intel 8212 interfacing with multiplexed 7-segment LED and matrix keyboard, Intel 8255 all modes, Timer 8253/8254 Keyboard/Display Interface 8279, Control words and interfacing.

(8)

MODULE – VI

Interrupt structure of 8085, Hardware and software interrupts, EI, DI, RIM and SIM instructions, Interfacing DAC 1408 and staircase ramp and triangular wave form generation, Interfacing ADC 0801, Applications.

(6)

MODULE – VII

Introduction to microcontroller, Popular microcontroller, Applications, Architecture of 8051 microcomputer, Internal and external memories, Interrupts.

(8)

Text Books:

1. Ramesh S. Gaonkar, Microprocessor Architecture - Programming, Applications
2. Raj Kamal, Microcontrollers - Architecture, Programming, Interfacing and System Design, Pearson Education.

Reference Books:

1. Renu Singh and B. P. Singh, Microprocessors, Interfacing and Applications, New Age International Publication.
2. A.P. Malvino, Digital Computer Electronics
3. S. K. Venkatram, Advanced Microprocessor & Microcontroller
4. A. P. Mathur, Introduction to Microprocessors

SIXTH SEMESTER

EE 6101	FUNDAMENTAL OF COMMUNICATION SYSTEM	1.0

MODULE – I

Elements and limitations of communication systems, modulation-benefits and its applications

(2)

MODULE – II

Fourier Transforms, properties of fourier transforms, power spectrum and spectral density, effect of transfer function on power spectral density, delta function.

(6)

MODULE – III

Amplitude modulation, generation, square-law modulator, Square law detector and envelope detector, DSB-SC : generation and coherent detection SSB – generation using frequency discrimination method, coherent detector, FDM, AM broadcasting and reception.

(8)

MODULE – IV

Angle modulation: basic concepts, single tone FM, transmission bandwidth, direct FM generation, balanced frequency, discriminator, FM radio receiver, Introduction to PAM, PWM, PPM

(8)

MODULE – V

Digital modulation: sampling, quantization, PCM and differential PCM, DM, TDM.

(5)

MODULE – VI

Digital modulation technique: binary modulation generation and detection of binary modulated wave, DPSK, QPSK, Matched filler, Digital communication by satellite.

(8)

MODULE – VII

Noise: Resister noise, noise in network with reactive elements, available power, noise temperature and noise figure of cascaded network.

(8)

Text Books:

1. Simon Haykin “Introduction to Analog and Digital Communication”

References Books:

1. H. Taub and D.L. Schilling, “Principles of Communication Systems
2. AB Carlson, “Communication Systems”
3. G. Kennedy, “Electronic Communication System.

EE 6103	POWER SYSTEMS ANALYSIS	1.0

MODULE – I

Per unit system representation, Reactance diagram, impedance diagram.

(5)

MODULE – II

Load flow Analysis: Load flow problem, Y_{bus}, Formulation of problem, Solution technique using Gauss- Siedal method.

(7)

MODULE – III

Symmetrical Short Circuits Analysis: Short circuit of a Synchronous machine on no load, Short circuit of loaded synchronous machine, Thevenin's equivalent circuit approach for short circuit analysis.

(7)

MODULE – IV

Symmetrical Components: Transformation, Phase shift in star-delta transformer, Sequence impedance and sequence networks of transmission line, Synchronous machine, Transformer and power system.

(8)

MODULE – V

Unsymmetrical Short Circuits: Symmetrical component analysis of unsymmetrical short circuits, Single line to ground fault, Double line to ground fault and line to line fault.

(7)

MODULE – VI

Power system stability problem, Swing equation, System response to small disturbances, Power angle equation and diagram

(6)

MODULE – VII

Transient stability, Equal area criterion, Measures for improving transient stability.

(5)

Text Books:

1. Stevenson and Grainger, Power system Analysis
2. Olle I. Elgerd, Electric Energy Systems Theory an Introduction

Reference Books:

1. Nagrath – Kothari, Modern Power System Analysis
2. C. L. Wadhwa, Electrical Power systems
3. B. R. Gupta, Power System Analysis

MODULE – I

Introduction: Basic components of control systems, Examples of control systems and applications, Open loop and closed loop control systems, Effect of feedback on overall gain, Stability and external disturbances, Classification of control system : Linear and nonlinear continuous and digital, Time invariant and time varying, Minimum phase and non-minimum phase systems etc. Linearization of nonlinear systems using Taylors series.

(6)

MODULE – II

Block Diagrams and Signal Flow Graph: Block diagrams of control systems, Block diagram reduction, Signal Flow Graph (SFG)- Basic properties of SFG, SFG algebra, Gain formula to SGP, Application of gain formula to block diagrams.

(6)

MODULE – III

Control System Components and Basic Control Actions: Sensors and encoders in control system, Potentiometer, Tachometers, incremental encoders, Synchros, Operational Amplifiers, Basic control actions: on-off control, P, PI, PD and PID.

(6)

MODULE – IV

Time Response of Control Systems: Transient and steady state response, Time response specifications, Typical test signals, Steady state error, and error constant, Stability- Absolute, relative and conditional stability, Dominant poles of transfer function.

Root Locus Methods: Root locus concept, Properties and construction of root locus, Determination of relative stability from root locus, Root sensitivity to parameter variation, Root contours, Systems with transportation lag and effect of adding poles or zeros.

(10)

MODULE – V

Bode Analysis and Introduction to Design: Frequency response specifications, Correlation between time and frequency domain Bode plot, Determination of stability using Bode plot, Introduction to compensation design using Bode plot.

(6)

MODULE – VI

Other Frequency domain Tools: Nyquist stability criterion, Theory of Magnitude phase plot, Constant M, constant N circle and Nichols chart.

(7)

MODULE – VII

Introduction to Design: Design specifications, Controller configuration, Fundamental principles of design, Time domain interpretation, Design of lag & lead compensation in time domain.

Text Books:

1. I. J. Nagrath & Gopal, "Control Systems Engineering", 4th Edition New Age International Publication.
2. K. Ogata, "Modern Control Engineering", 3rd Edition, Pearon Education.

Reference Books:

1. Norman Nise, "Control System Engineering, 4th Edition, Wiley.
2. Graham C. Goodwin, "Control System Design", PHI.
3. B. C. Kuo, "Automatic Control System", 7th Edition, PHI.

MODULE – I

Scope of power electronics, Overview of high power semiconductor switches, Two transistor analogy of SCR terminal characteristics, Rating and protection of SCR, UJT and Industrial firing circuit.

(6)

MODULE – II

Dynamic characteristics of SCR, Gate characteristics, series and parallel operation of SCR, power diodes.

(6)

MODULE – III

Single phase controlled, Half wave, Full wave rectifier with R, RL and RLE loads, Single phase semiconverter, Effect of Source impedance performance, Evaluation of converter using Fourier series analysis.

(7)

MODULE – IV

Three phase uncontrolled rectifier with resistive load, Three phase half wave, Full wave rectifiers with R-load, 3-phase semiconverter, RMS, Average value, Fourier analysis,THD, HF and PF of converter.

(6)

MODULE – V

Chopper, Introduction, Principle of operation control, Strategies, Step-up and step-down chopper, Chopper configuration, Type A,B,C,D & E chopper uses.

(6)

MODULE – VI

Single phase inverter, VSI and CSI, Analysis with R, RL, and RLC loads, 180^{o} and 120^{o} mode of operation of 3-phase VSI, SPM, MPM and Sinusoidal PWM techniques, Series inverters use.

(7)

MODULE – VII

AC voltage regulators, 1-phase ac voltage controller with R and RL loads, Integral cycle control. **Cycloconverters:** Introduction, The basic principle of operation, Steps up and step-down cycloconverter, Single phase to single phase cycloconverters.

(7)

Text Book:

1. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi 2001

Reference Books:

1. M.H. Rashid, Power Electronics: Circuits, Device and Applications, 2nd Ed.n, PHI, New Jersey, 1993.
2. S.N.Singh, A Text Book of Power Electronics, Dhanpat Rai & Co., New Delhi 1st Edn., 2000.
3. Mohan, Underland, Robbins; Power Electronics Converters, Applications and Design, 3rd Edn., 2003, John Wiley & Sons Pte. Ltd.
4. R.S. Ramshaw, Power Electronics Semiconductor Switches, 2nd Edition, 1993, Chapman & Hall, Chennai.
5. V.R. Murhty, Power Electronics, Oxford Publishers.

EE 6109 RELATIONAL DATABASE MANAGEMENT SYSTEMS 1.0

INTRODUCTION: Need for DBMS and RDBMS and their advantages, Definition of a Database Organization and its objectives.

(3)

REVIEW OF LOGICAL ORGANIZATION: Definition of a database – Entities and attributes – Data Models (schemas and subschemes) – DBMS – structures (Tree and plex), Data Description Languages – Relational Databases – Third Normal Form – Canonical Data Structure.

(12)

REVIEW FO PHYSICAL ORGANIZATION: Difference between physical and logical organization – Addressing Techniques – Indexed Sequential Organizations – Hashing – Pointers – Chains and Ring Structures – physical representations of tree and plex structures – Multiple keyretrievals – Separating Data and Relationships – Index Organization – Index Searching Techniques, Inverted file systems – Data compaction – Volatile files – Associative memory.

(15)

DATABASE DEVELOPMENT: Development of simple example databases using ORACLE (7.0/8i) and Developer 2000 packages and RDBMS features.

(15)

Text Books:

1. Martin, James, “Computer Data-Base Organization”, Second edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
2. ORACLE (7.0/8i) and Developer 2000 Books and Software packages of Any publisher (EEE/PHI Pvt. Ltd./ any other)

SEVENTH SEMESTER

EE 7101	APPLIED POWER ELECTRONICS	1.0

MODULE – I

Review of modern high power switches like GTO power BJT, Power MOSFET, IGBT, SIT, SITH, IGCT and MCT., Equivalent circuit, principle of operation, characteristics, FSOA, RSOA, rating of IGBT.

(7)

MODULE – II

Introduction, Resonant Converter, Series inverter with unidirectional switches, Bidirectional switches, Buck, Boost converter, Flyback converter, Forward converter, Parallel resonant inverter.

(8)

MODULE – III

Control Circuits for Electronic Equipments: Introduction, pulse transformer, Opto-isolators, Different schemes for gate firing, Zero crossing detection, Drive Circuits for power transistor Drive circuits for MOSFET, Transformer-isolated circuits for driving MOSFETs and IGBTs. Dual converter, Drive circuit for MOSFET, BJT, IGBT and Thyristor

(8)

MODULE – IV

Pulse width Modulation Techniques: Introduction, Carrier-Based PWM, Sinusoidal, Space vector PWM, Hysterisis- Band controller.

(5)

MODULE – V

Inverter Circuits: 3-ϕ bridge type CSI, Load commutated inverters (LCI), Line commutated converter, Bridge inverter, Features of LCI, Application of LCI, Current-fed Vs. Voltage-Fed converters, 3-phase series inverters.

(7)

MODULE – VI

FACTS Controller: Transmission Line compensation, STATCOM, SSSC, UPFC, IPFC, Comparison, Advantages of FACTS controller, Application of FACTS controller.

(5)

MODULE – VII

MEMS: Introduction, Scope of MEMS, Advantages and application of MEMS.

(5)

Text Book:

1. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.

Reference Books:

1. Ned Mohan et al. “Power Electronics Converter Applications & Design”, John Wiley and Sons, Inc. Singapore 2004.
2. V.R. Moorthi, Power Electronics, Devices Circuits and Industrial Applications, Oxford University Press, New Delhi, 2005.
3. M.H. Rashid, “Power Electronics Circuits, Devices and Applications”, Pearson Education, Singapore, 1993.
4. B.K. Bose, “Modern Power Electronics and AC Drives” Pearson Education Asia, Singapore, 2002.

MODULE – I

Electrical Drives: An Introduction, Parts of Electrical Drives; ac and dc Drives.

Dynamics of Electrical Drives: Fundamental torque equations, Speed torque conventions and multi-quardant operation; Equivalent value of drive parameters with respect to motor side. Different Load Torques and their nature; Steady- state stability; Load Equalization

(7)

MODULE – II

Control of Electrical Drives: Introduction; Closed-loop Vs open loop control of drives, Modes of Operation; Speed Control & Drive Classifications; Closed - Loop Control of Drives; Speed and current sensing; Manual, Semi-Automatic & Automatic Control; Magnetic and Static Control; Power Circuit and Control circuit and their Development; Interlocking & sequential operation.

(8)

MODULE – III

Selection of Motor & Its Power Rating: Types of Motors & their Enclosures; Thermal Model of Motor for Heating & Cooling; Classes of Motor Duty; Determination of Motor Rating, Cooling of rotating electrical machines.

(6)

MODULE – IV

D.C. Motor Drives: Introduction, Performance characteristics of DC Motors & their Modifications; Starting & Design of Starting Circuits; Braking; Speed Control; Converter - controlled DC Drives; Chopper-controlled DC Drives. Single phase converter drives, Three phase converter drives, Closed loop control of dc motor, Chopper-based dc drives, Dual converter drives,

(7)

MODULE – V

Induction Motor Drives: Introduction, Speed-torque characteristics, Braking; Speed Control, Starter voltage control, Variable frequency control from voltage source, Slip speed control, Rotor resistance control, Slip power recovery schemes, Cycloconverter control.

(5)

MODULE – VI

Inverter Control of Induction Motor: Voltage source inverter control (VSI), Scalar control, open loop and closed loop volts/Hz control, Variable frequency, Control from a current source Inverter(CSI), Closed Loop speed control of CSI drives, Comparison of CSI and VSI drives.

(6)

MODULE – VII

Synchronous Motor Drives: Starting, Pull-in and Braking with Fixed Frequency Supply; Variable Speed Drives, Trapezoidal PMAC motor drives, Close loop speed control of Synchronous Machines in feedback mode.

(6)

Text Book:

1. G.K. Dubey, Fundamentals of Electrical Drives, Narosa publication, New Delhi

Reference Books:

1. S.K.Bhattacharya & Brijinder Singh., Control of Electrical Machines
2. Mukhtar Ahmad Industrial Drives and Control
3. S.K.Pillai, A first course on Electrical Drives
4. M. Chilikin, Electric Drives.
5. P.S Bhimbra, A text Book Power Electronics
6. Sharma and Khanchandani, Power Electronics, TMH,Delhi

EE 7105	SWITCH GEAR AND PROTECTION	1.0

MODULE – I

Circuit Breakers: Arc voltage, Mechanism of arc interruption, Restriking voltage and recovery voltage, Classification of CBs, Oil CBs, Air CBs, Vacuum CBs, Sf6 CBs, HVDC CBs, Rating and Testing of CBs.

(15)

MODULE – II

Protective Relaying: Introduction to protective relaying, Thermal relay, Over current relay, Directional relay, Differential relay.

(4)

MODULE – III

Transmission Line and Feeder Protection: Over current and directional relay applications, Distance protection using impedance relay, Reactance relay, MHO relay.

(5)

MODULE – IV

Generator Protection: Protection against stator and rotor faults and abnormal operating conditions such as unbalanced loading, loss of excitation, Over speeding.

(6)

MODULE – V

Transformer Protection: Types of faults, Over current protection, Differential protection, Differential relay with harmonic restraint, Protection against high resistance ground faults, Interturn faults, Bucholz relay.

(5)

MODULE – VI

Introduction Motor Protection: Protection against phase fault, ground fault and abnormal operating conditions such as single phasing, Phase reversal and overloading.

(5)

MODULE – VII

Introduction to carrier-aided protection and numerical protection

(5)

Text Books:

1. Power System Protection & Switch Gear : Badriram and Vishwa Karma, TMH Publications.
2. Switch Gear and Protection Sunil S. Rao, Khanna Publications

Reference Books:

1. Power System Protection & Switch Gear: Ravindranath & Chander, New Age Publications.
2. The Art and Science of Protective Relaying: C. Russel Mason, Wiley Bastern Ltd.

MODULE – I

Introduction: Electric Field Stresses, Gas/Vacuum as Insulator, Liquid Breakdown, Solid Breakdown, Estimation and Control of Electric Stress

(3)

MODULE – II

Conduction and Breakdown in Gases: Gases as Insulating Media, Ionization Processes, Townsend's Current Growth Equation, Townsend's Criterion for Breakdown, Breakdown in Electronegative Gases, Time Lags for Breakdown, Streamer Theory of Breakdown in Gases, Paschen's Law, Breakdown in Non-Uniform Fields and Corona Discharges, Post-Breakdown Phenomena and Applications, Vacuum Insulation.

(6)

MODULE – III

Conduction and Breakdown in Liquid and Solid Dielectrics:

Liquid Dielectrics- Liquids as Insulators, Pure Liquids and Commercial Liquids, Conduction and Breakdown in Pure and Commercial Liquids.

Solid Dielectrics- Introduction, Intrinsic Breakdown, Electromechanical and Thermal Breakdown, Breakdown of Solid Dielectrics in Practice, Breakdown in Composite Dielectrics.

(10)

MODULE – IV

Generation and Measurement of High Voltage and Currents: Generation of High dc voltages, Generation of High alternating voltages, Generation of impulse voltages, Generation of impulse currents, Tripping and control of impulse generators.

Measurement of High direct current voltages, Measurement of High ac and impulse voltages, Measurement of High impulse currents.

(10)

MODULE – V

Design, Planning and Layout of High Voltage Laboratories: Introduction, Test Facilities provided in high voltage laboratories, Activities and studies in high voltage laboratories, Classification of high voltage laboratories, Size and Rating of large size high voltage laboratories, Grounding of impulse testing laboratories

(3)

MODULE – VI

EHVAC Transmission: General background and transmission technology, Comparison of different EHVAC line based on transmitted power, Transmission losses and SIL, Bundled conductors, Inductance and capacitance of transmission line, Transmission line

(7)

MODULE – VII

HVDC Transmission: Advantages and disadvantages of HVDC transmission, equivalent circuit of HVDC system, method of generation of HVDC. (6)

Text Book:

1. High Voltage Engineering, MS Naidu and V. Kamaraju, TMH New Delhi
2. Extra High Voltage AC Transmission by R. D. Begamudre, Wiley Eastern ltd.
3. HVDC Power Transmission System by K. Padiyar

Reference Book:

1. High Voltage Engineering, CL Wadhwa, New Age International (P) Limited, Publishers, New Delhi
2. High Voltage Engineering Fundamentals, E. Kuffel and WS Zaengl, Pergamon Press, Oxford.
3. Electrical Breakdown of Gases, JM, Meek and JD, Crages, John Wiley, New York.
4. EHV AC and DC Transmission Engineering and Practice by S. Rao, Khanna Publication

MODULE – I

Accounting of Business Transactions: Accounting principles, Journal and ledger entries, Balance sheet, Profit and loss statement, Ratio analysis.

(8)

MODULE – II

Cost and Cost Analysis: Cost structure, Methods of allocating overhead costs, Standard cost, Concept of opportunity cost, Sunk cost, Fixed cost and variable cost.

(5)

MODULE – III

Break Even Analysis: Drawing of brake even charts, Effect of different variable on break even point, Cost comparison of two or three alternatives.

(5)

MODULE – IV

Time Value of Money: Single sum and series of cash flow, Uniform and gradient series, Multiple compounding periods in a year, Continuous compounding, Bonds.

(8)

MODULE – V

Comparison of Alternative Proposals: Basic of comparison - present worth amount, Annual equivalent amount, Future worth amount, Rate return, Mutually exclusive alternatives, decision criteria for selection of investment proposals, Comparison of alternatives with unequal service life sensitivity analysis.

(6)

MODULE – VI

Replacement Analysis: Reasons for replacement, evaluation of replacement involving excessive maintenance cost, Decline in efficiency inadequacy and obsolescence.

(6)

MODULE – VII

Depreciation and Decision Making Under Uncertainty: Methods of depreciation and their comparison, Decision making on the basis of expected value decision tree in the evaluation of alternatives.

Text Books:

1. Modern Accountancy by I.M. Pandey
2. Engineering Economy by E.P. Degrama.

ELLECTIVE

EE 7111	COMPUTER AIDED POWER SYSTEM ANALYSIS	1.0

MODULE – I

Introduction: The new computer environment, Basic single-phase modeling- Generator, Transmission lines, Transformer- Off nominal transfer tap representation, Phase shifting representation.

(4)

MODULE – II

Load Flow Analysis: Introduction, Nature of load flow equations, Computational steps and flow chart of Gauss Seidal Techniques, Newton Raphson method: Formulation for load buses and voltage controlled buses in rectangular and polar co-ordinates, Computational steps and flow chart.

(7)

MODULE – III

Computational Aspects of Large-scale System: Sparsity of Y_{bus} and Jacobian matrix, Sparsity oriented computer programming, Reducing storage requirement, Decoupled power flow algorithm.

(4)

MODULE – IV

Short Circuit Analysis: Introduction, Bus impedance matrix and its building algorithm through modifications, Symmetrical and unsymmetrical fault calculation using Z_{bus} and its computational steps.

(8)

MODULE – V

Optimal System Operation: Introduction, Characteristic of steam and hydro units, Economic dispatch of thermal units, Equal incremental cost operation, Computational steps, Transmission loss and incremental transmission loss (ITL), Computational aspects.

(7)

MODULE – VI

Unit Commitment - Introduction, Objective function, Constraints, Dynamic programming method

(4)

MODULE – VII

Power System Stability: Stability problem, swing equation and its numerical solution, Determination of initial state in a multimachine system, Base case Y BUS and modified Y BUS, Computational algorithm, Improvement of stability.

(6)

Text Books:

1. Power System Analysis - John J. Grainger, William D. Stevenson, Jr.
2. Power System Analysis - L. P. Singh

Reference Books:

1. Electric Energy Systems Theory - An Introduction, O.L. Elgerd.
2. Computer Modelling of Electrical Power Systems - J. Arrillaga, N.R. Watson
3. Power Generation Operation and Control - A.J. Wood, B.F. Wollenberg

ELLECTIVE

EE 7113	TESTING AND COMMISSIONING OF ELECTRICAL-EQUIPMENT	1.0

MODULE – I

Transformers: Specification, Installation- Location and sites, Selection and design of foundation details (like bolts size, their number, etc.) code of practice for terminal plates, polarity and phase sequence, Oil tanks, drying of windings with & without oil, general inspection.

(6)

MODULE – II

Commissioning Test: Following tests as per national & International standards, Volt ratio test, Earth resistance oil strength, Bochholz & other relays, tap changing gear, Fans & pumps, Insulation test, impulse test, polarizing index, load & temperature raise test. Specific Test- Determination of performance curves like efficiency, regulation etc., Determination of mechanical stress under normal & abnormal conditions, Maintenance Schedule

(7)

MODULE – III

Inductioni Motors: Specifications for different types of motors, Duty, el L.P., protection. Installation- Location of the motors (including the foundation details) & its control apparatus, Shaft & alignment for various coupling, fitting of pulleys & couplings, Drying of windings

(6)

MODULE – IV

Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing. Electrical Tests - Insulation test, earth resistance, High voltage test, starting up failure to speed up to take the load type of test, routine test, factory test and site tests (in accordance with ISI code). Specific Tests : Performance & temperature rise tests, stray load losses, shaft elements, re-rating & special duty capability. Maintenance Schedule.

(7)

MODULE – V

Synchronous Machines: Specifications, Installation- Physical inspection, Rating nameplate details, Foundation details, Alignments, Excitation systems, Cooling & control gear, drying out. Commissioning Tests- Insulation, Resistance measurement of armature & field wings, Wave from & telephone interference factors, Line charging capacity.

(7)

MODULE –VI

Performance Tests: Various tests IP estimate the performance for generator & motor operations slip maximum lagging currents, Maximum reluctance power tests, Sudden short circuit tests, transient & sub transient parameters, measurements of sequence impedances, capacitive reactance, Separation of losses, temperature rise tests, Retadation tests. Factory Tests - Gap length, magnetic centrity balancing vibration, bearing performance

(5)

MODULE – VII

Switchgear & Protective Divices: Standards, types, Specification, Installation, Commissioning tests, Maintenance schedule, Type & routine tests.

(6)

Text Books:

1. S. Rao, Testing & Commissioning of electrical equipment, Khanna Publishers
2. B.V.S. Rao, Testing & Commission of electrical equipment

Reference Books:

1. Relevant Bureau of Indian Standards
2. Transformers - BHEL
3. J & P transformer Handbook
4. J & P Switch gear Hand Book

ELLECTIVE

EE 7115	CONTROL SYSTEM DESIGN	1.0

MODULE – I

Introduction, Design specifications, Controller configurations, Fundamental principles of design, Design with PD controller- Time-domain interpretation of PD control, Frequency domain interpretation of PD controller, Summary of effects of PD control, Design with PI controller- Time-Domain interpretation of PI control, Frequency domain interpretation of PI controller, Summary of effects of PI control.

(8)

MODULE – II

Design with PID Controller: Design with phase lag controller- Time-Domain interpretation of phase lag control, Frequency domain interpretation of phase lag controller, Summary of effects of Phase lead control, Design with Phase lead controller, Time-Domain interpretation of phase lead control, Frequency domain interpretation of phase lead controller, Summary of effects of phase lead control, Multistage phase lead controller.

(8)

MODULE – III

Design with lag-lead controller, Pole zero cancellation design, Notch filter, Forward and feed forward controllers, Design of Robust control system, Minor loop feedback control systems.

(6)

MODULE – IV

Hardware and software implementation of common compensator: Physical realization of common compensators with active and passive elements, Tunable PID algorithms- Position and velocity algorithms, Ziegler-Nichols method for controller tuning.

(6)

MODULE – V

State feedback control, Pole placement design through state feedback, State feedback with integral control, Design of state observer

(8)

MODULE – VI

Design of discrete data control systems: Introduction, Digital implementation of analog controller (PID) and lead-lad controllers, Digital controllers, Design of discrete data control system in frequency domain and Z-plane.

(4)

MODULE – VII

Synthesis through pole zero configuration, Determination of closed loop system functions from the specifications, Determination of open loop transfer function form the closed loop transfer function, Additional correlation between open loop and closed loop characteristics.

(3)

Text Books:

1. B.C. Kuo, "Automatic Control System", 7th Edition PHI.
2. M. Gopal, "Control Systems Principles & Design", 2nd Edition, TMH.
2. J.G. Truxal, "Automatic Feedback Control System", McGraw Hill, New York.
3. K. Ogata, "Discrete Time Control Systems", 2nd Edition, Pearson Education.

Reference Books:

4. Norman Nise, "Control System Engineering", 4th Edition.
5. M. Gopal, "Digital Control & State Variable Method", TMH.
6. B.C. Kuo, "Digital Control System", 2nd Edition, Oxford.

ELLECTIVE

EE 7117	NEURAL NETWORKS	1.0

MODULE – I

Introduction: Brain & Machine, Biological Neurons & its mathematical model, Artificial Neural Networks, Benefits and Applications, Architectures, Learning Process (paradigms & algorithms), Correlation Matrix Memory, Adaptation.

(6)

MODULE – II

Supervised Learning I: Pattern space and Weight space, Linearly & non Linearly separable classes, Decision Boundary, Hebbian learning & limitation, Perceptron, Perceptron convergence theorem, Logic Functions implementations.

(6)

MODULE – III

LMS Algorithm: Wiener-Hopf equations, Steepest Descent Search method, LMS algorithm, Convergence consideration in mean & mean square, Adaline, Learning curve, Learning rate annealing schedules.

(7)

MODULE – IV

Supervised Learning II: Multilayer Perceptrons, Backpropagation algorithm, XOR Problem, Training modes, Optimum learning, Local minima, Network Pruning techniques.

(7)

MODULE – V

Unsupervised Learning: Clustering, Hamming Networks, Maxnet, Simple competitive learning,Winner-Take-All Networks, Learning Vector Quantizers, Counterpropagation Networks, Self Organising Maps (Kohonen Networks), Adaptive Resonance Theory.

(6)

MODULE –VI

Associative Models: Hopfield Networks (Discrete and continuous), Storage capacity, Energy Function & minimization, Brain-State-in-a-Box Neural Network.

(6)

MODULE – VII

Applications of ANN & Matlab Simulation: Character Recognition, Control Applications, Data compression, Self organizing semantic Maps.

(7)

Text Books:

1. Neural Networks: A Comprehensive Foundation – Siman Haykin. (Pearson Education)
2. Elements of Artificial Neural Networks – Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka. (Penram International Publishing, India)

Reference Book

1 Neural Networks: A Classroom Approach – Satish Kumar, Tata McGraw Hill

ELECTIVE

EE 7119 EMBEDDED SYSTEM AND ADVANCED PROCESSORS 1.0

MODULE – I

INTRODUCTION: Embedded Systems Overview, Processor technology- General purpose processors (Software), Single purpose processors (Hardware), Application- Specific processors; IC Technology- Full-costom/VLSI, Semicustom ASIC (Gate Array and standard cell), PLD, etc.

(5)

MODULE – II

BASIC CONCEPTS OF COMPUTER ARCHITECTURE: Concepts, Memory, Input/Output, DMA, Parallel and Distributed computers, Embedded Computer Architecture, etc.

(7)

MODULE – III

EMBEDDED PROCESSORS & SYSTEMS: The PIC Micro-controllers- A Tale of Two Processors, Starting Example using Minimal PIC 12C508 Computer and PIC 16C73 Processor, The AVR Microcotnrollers- The Atmel ATtiny15 AVR Processor and Architecture, Downloading code; The Bigger AT 90S835 Processor and Support Components, Bus interfacing, AT 90S8515 Memory Cycle and Bus Signals, Memory Maps & Address Decoding, Programmable Logic (PALs, LCAs or PLDs), Timing Analysis and memory Management.

(10)

MODULE – IV

MC 68000 SERIES COMPUTERS: A Simple 68000 Architecture; A Simple 68000-Based Computer - Reset Circuit, Address Decoder I/O (Multifunction Peripheral), Memory Interfacing to SRAM and EPROMs, Wait-State Generator, etc.

(4)

MODULE – V

DSP-BASED CONTROLLERS: DSP 56800 Programmer's Model, A DSP 56805- Based Computer- DSP 56805 Block Diagram, Crystal Oscillator Circuit and Module, Reset and Interrupts, External Memory, Interfacing to Program SRAM and Data SRAM, Shared Program and Data memory, Address Decoder for Two 32 K SRAMs and Eight Peripherals, JTAG.

(5)

MODULE – VI & VII

PERIPHERALS AND INTERFACING: Adding Peripherals and Interfacing- Serial Peripherals and Interfacing- Serial Peripheral Interface (SPI), Inter Integrated Circuit (I^2C), Adding a Real-Time Clock with I^2C, Adding a Small Display with I^2C; Serial Ports - UARTs, Error Detection, RS-232C & RS-422, Infrared Communication, USB, Networks- RS-485, Controller Area Network (CAN), Ethernet, Analog Sensors - Interfacing External ADC, Temperature, Sensor, Light Sensor, Accelerometer, Pressure Sensors, Magnetic - Field Sensor, DAC, PWM; Embedded System Applications - Motor Control, and Switching Big Loads.

(14)

Reference Books:

1. Catsoulis, John, "Designing Embedded Hardware", First/Second Edition, Shroff Publishers & Distributors Pvt. Ltd., New Delhi, India.
2. Vahid, Frank and Givargis, Tony, "Embedded System Design - A Unified hardware/Software Introduction", John Wiley & Sons, (Asia) Pvt Ltd., Replika Press Pvt., Delhi - 110040.

ELECTIVE

EE 7121	MICROPROCESSOR APPLICATIONS	1.0

MODULE – I & II

Architecture and Application oriented assembly language programming on Intel 8086/8088 family of microprocessors on a P.C. Assembly language programming using DOS and BIOS function calls, using keyboard, display, I/O, Printer, and RS232C port functions.

(12)

MODULE – III

Assembly programming using MASM with code view facility with all assembler directives, source level debugging and use of watch windows to identify programme errors. Programming the Numeric processor (Intel 8087 NDP)

(8)

MODULE – IV & V

Architecture and Application oriented programming, using MC 68000 family of processors. Use of development systems, Assembling, linking and debugging.

(12)

MODULE – VI & VII

Architecture and Assembly language programming using Z-80 family of microprocessors, Real time Emulation, and simulation for application programmes, Programme development, hardware configuration and software design examples using:

A/D - D/A interface with processors.
I/O - interfacing using Intel 8255, MC 6820 - 6822, Z-80 PIO.
Video I/O using MC 6845 or Intel 8275.
Serial I/O using Intel 8251/Z-80-CTC.
Floppy disk controller Intel 8272.
Dynamic RAM Controller Intel 8202 family.
DMA Controller Intel 8237 Chip

(13)

Text Books:

1. Liu, Yu-Chang and Gibson, Glenn, A., “Microcomputer Systems, The 8086/8088 Family”, PHI, New Delhi.
2. Leventhal, L.A., et al., “68000 Assembly Language Programming”, Second Edition, Osborne Mc-Graw-Hill International Editions, Berkley, California, USA.
3. Osborne, Adan and Kane, Jerry, “An Introduction to Microprocessors,” Volume-2, Parts A and B, Galgotia Book Source, Publishers, P.O. Box 688, New Delhi - 110001.
4. Douglas V. Hall, "Microprocessors and Interfacing: Programming Hardware", First/Second Edition, TMH Publishing Company Ltd., New Delhi.

EIGHTH SEMESTER

EE 8101	APPLIED CONTROL THEORY	1.0

MODULE – I

Concepts of State, State Variables: Development of state-space models. State and state equations, State equations from transfer function Transfer function from state equations. State transition matrix, Solution of State equation, Transfer Matrix, State variables and linear discrete time systems

(7)

MODULE – II

Controllability and Observability: Controllable and observable State models, Controllability and observability for discrete time systems.

(5)

MODULE – III

State Variable Feedback: Asymptotic state observers. Control system design via pole placement.

(4)

MODULE – IV

Optimal Control Systems: Introduction, Performance indices, Optimal control problems-Transfer function approach, State variable approach; Parameter optimization.

(5)

MODULE – V

Non-Linear Systems: Introduction. Common nonlinearities. Methods of studying non-linear systems: Linearization; Describing function analysis; Phase plane analysis.

(8)

MODULE – VI

Stability of Non-Linear Systems: Stability concepts. Stability analysis using Lyapunov's Direct method; Popov's stability criterion.

(3)

MODULE – VII

Adaptive Control Systems: Performance indices. Adaptive Controllers, Identification of dynamic characteristics of the plant

(4)

Text Book:

1. Control Systems Engineering- I.J. Nagrath & M. Gopal.

Reference Books:

1. Modern Control System Theory- M. Gopal.
2. Modern Control Engineering- K. Ogata.
3. Control Systems- N. K. Sinha.

MODULE – I

Electric Traction: Introduction, Requirements of Ideal Traction System Supply system for electric traction, Train movement Energy consumption. Co-efficient of adhesion, The traction motors starting, Breaking of Traction motors.

(6)

MODULE – II

Speed Control of Traction Motor: Semiconductor converter controlled drives of Traction Motor, Chopper controlled DC traction motor drives. PWM Voltage source inverter (VSI) Induction motor drives, Load commutated inverter fed synchronous motor drivers, CSI squirrel Cage IM drive, PWM VSI Squirrel cage IM drive. Drives of Diesel Electric Traction Motors: Diesel Engine driven D.C Generator Feeding dc series motors. Diesel Engine driven three-phase alternator supplying dc motors.

(8)

MODULE – III

Heating & Welding: Introduction, Different methods of heating, Temperature control of resistance furnace, Induction heating, Dielectric heating, Electric welding, Different welding methods, current control of welding transformer, Ultrasonic and laser welding.

(7)

MODULE – IV

Illumination: Introduction, Nature of radiations, Definitions. Polar curve, Laws of Illumination, Luminous Efficacy, Source of light, Incandescent, Vapour, Flourescent Lighting calculations, Flood lighting, Street lighting.

(7)

MODULE – V

PLC: Introduction, Ladder diagram fundamentals of PLC: Introduction, Basic components and their symbol, Fundamentals of ladder diagram. PLC configurations. System Block Diagram, Update-solve the ladder Network.

(6)

MODULE – VI

Fundamental PLC Programming: Physical components Vs. Programme components, Internal Relays, Disagreement circuit. Ladder programme, Execution sequence, Flip-Flop circuits, Mnemonic programming code: AND ladder rung, Entering normally closed contracts, OR ladder rung, Simple branches, Complex branches.

(6)

MODULE – VII

Motor Control Circuit Components, Interlocking methods for reversing control, Sequence control, Schematic and wiring diagram for motor control circuits, Remote control operation of an IM, Motor driven pump for a water tank, automatic water level control, Sequence operation of motors with interlocking arrangements.

(6)

Text Books:

1. Generation, Distribution and Utilisation of Electric Power C.L. Wadhwa, Wiley - 1993.
2. Electrical Design and Estimating and costing - K.B.Raina and S.K.Bhattacyarya, Wiley Delhi - 1993.
3. Fundamentals of Electrical Drives , G.K.Dubey , Narosa publication,New Delhi

Reference Books:

1. Utilization of Electric Power, N.V. Suryanarayana, Wiley - 1994.
2. Utilization of Electric Power - Taylor.

INTRODUCTION

MODULE – I

Definition and Components of Information Technology: It's Need and Role in Technological/ Commercial/ Rural/ Industrial/ Socio-economic Developments, Entertainment Industies, and in sectors like: Education, Defence, Communication, Stock Exchange, Banking, Biomedical, Nuclear, Judiciary, Police & Intelligence Network, Central & State Governments, etc.

(2)

INTERNET (COMPUTER NETWORKS)

MODULE – I & II

Network structures: Network Architectures - The QSI Reference Model - Connection - Oriented and connectionless Services - Transmission Media - Wireless, Analog and Digital Transmission - Transmission and Switching - Basic ISDN Concept - LAN, MAN & WAN - IEEE Standard 802 for LANs - Fibre Optic Networks - Satellite Networks - Data Link Layer Design Issues, Error Detection and Correction - HDLC Protocol - Network Layer Design Issues - Internetworking and OSI (Bridges, Gateways, etc.) - The Global Internet - TCP/IP Protocol.

(9)

(Contents Ref.: [1] - Ch. 1, 2, 3, 4, 5, 6.4)

MODULE – III & IV

Client/Server Models: Names for Computers in Internet - Services Available on the Internet (E-mail, E-com, Network News, FTP, TELNET, Browsing the Worldwide Web, World Wide Web Documents (HTML), Advanced Web Technologies, Automated Web Search, Audio and Video Communication, Global Digital Library etc.) - Main Features of some Example Internet Services - Security of Internet Services (Public Key Cryptography, Authentication and Digital Signatures).

(8)

Ref.: [1] - Ch. 7.1; [2] Ch. 9, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27)

MULTIMEDIA

MODULE – V

Elements of Interactive Computer Graphics for Multimedia: Primary and Secondary Colours - Beam Penetration Type Color CRT - Refresh Display Processors - Random Scan Line Displays - A Simple Graphics Package - Display Files - Graphical Input Devices and Techniques - Event Handling - Input Functions - Raster Display Hardware and Scan Conversion.

(6)

(Contents Ref.: [3] - Ch. 2, 3, 6, 7, 11, 12, 13, 14, 15, 19)

MODULE – VI

Multimedia Hardware & Software: Multimedia & Windows - Multimedia Hardware (Equipment, CD-ROM Drive, Sound Card, Sampling, Screen Display, Image Capture Card, etc.) - Sound Characteristics, Digital Audio, MIDI, & Media Player - Recording, Editing and Playing Back Sounds - Recording and Playing Back Images, Graphics, Video and Animation - Video Compression Methods - Using CD-ROMs - Hypermedia and Hypertext - Creating a Multimedia Presentation - Authoring Software- Internet and Multimedia.

(9)

(Contents Ref.: [4] - Ch. 1, 2, 4, 5, 6, 7, 8, 9)

EXPERT SYSTEMS, KNOWLEDGE-BASED INDUSTRIES & INTERNET
MODULE – VII

Definition and Artificial Intelligence: Representation in AI - Properties of Internal Representation - First Order Predicated Calculus - Inferences - Abduction - Induction - Indexing - Semantic Networks - Isa Hierarchy - Slot Assertion Notation - Frame Notation - Context Free Grammars - Top-Down & Bottom-up Syntactic Parsing -Knowledge-base/Databases - Rule-based Programming - Expert Systems Design and On Line Information Retrieval.

(9)

(Contents Ref.: [5] - Ch. 1, 4, 7. 6; [6] - Ch. 1, 6)

A PARADIGM
MODULE – VIII

Information Technology as a Tool and Backbone for Modern Education System

(2)

Text Books:

1. Tanenbaum, Andrew. S, “Computer Networks”, Third Edition, Prentice-Hall of India, Pvt. Ltd., New Delhi, India.
2. Comer, Douglas E., “The Internet Book”, Second Edition Prentice-Hall of India Pvt. Ltd., New Delhi, India.
3. Newman, William M. and Sproull, Robert F., “Principles of Interactive Computer Graphics”, Second Edition, McGraw-Hill International Book Company, New Delhi, India.
4. Collin, Simon, “Multimedia Made Simple”, Asian Books Pvt. Ltd., New Delhi, India.
5. Charniak Eugene and McDermott, Drew, “Introduction to Artificial Intelligence”, Addison-Wesley Publishing Company, California, U.S.A.
6. Morris, Anne, Editor, “The Application of Expert Systems in Libraries and Information Centres”, Bowker-Saur, New York, U.S.A.

MB 6101	PRINCIPLES OF MANAGEMENT	1.0

MODULE – I

Concept of Management: Definition, Nature, and scope, and overall view of Management, Relation with other social sciences and industry.

(4)

MODULE – II

Evolution of Management thought:

(A) Classical theory of Management
(A1) Bureaucracy- Introduced by Max Waber
(A2) Scientific Management - F.W. Taylor and his followers
(A3) Process Management - Introduced B.H. Fayol and others.
(B) Neo-clasical theory of Management
(B1) Human Relations- B.E. Mayo and Roethlisberger
(B2) Behavioural Science approach - By McGragor,Maslow & others
(C) Modern Management theories: Peter Drucker

(8)

MODULE – III

Management Functions: Planning, Organising, Staffing, Directing, and Controlling.

(2)

MODULE – IV

Executive Functions: Production, Marketing, Finance, Personnel.

(2)

MODULE – V

Planning: Concept, Nature, Importance, Objectives, Policies, Procedure, Strategies and Method of Decision Making

(6)

MODULE – VI

Organisation: Definition, Theories of Organisation, Forms of organisation, Formal and Informal Organisation, Types of Formal Organisations, Departmentation, Line and Staff Relationship, Span of Management, Authority, Responsibility, Delegation, Centralisation, Decentralisation, Committees.

(8)

MODULE – VII

Staffing: Selection, Recruitment, Training, Development and Welfare

(3)

MODULE – VIII

Directing: Leadership and Supervision, Motivation and Communication

(8)

MODULE – IX

Controlling: The Elements, Process and style of Control, Techniques of control. Social Responsibility of business

(2)

Text Books:

1. Koontz and O'Donnel - Principles of Management, Essentials of Management.
2. Theo Haiman - Management Theory and Practice.

Reference Books:

1. D.F. Drucker - Management - Tasr and Responsibility
2. P.F. Drucker - The Practice of Management
3. Newman and Warren - Process of Management
4. E.F.L. Beach- The Principles and Practical Management
5. H.F. Merril - Classics in Management - Preface
6. Mee J.E. - Management Thought in a Dynamic Economy
7. Daniel A. Wren - The Evolution of Management - Thought
8. S. N. Banerjee - Principles of Management

ELECTIVE

EE 8107	FUZZY LOGIC CONTROL	1.0

MODULE – I

Introduction: Background, uncertainty and imprecision, statistics and random processes, uncertainty in Information. Fuzzy sets and membership, chance versus ambiguity, fuzzy control from an industrial perspective, Knowledge based systems for process control, knowledge based controllers, knowledge representation in knowledge based controllers.

(3)

MODULE – II

Mathematics of Fuzzy Control: Classical sets, Fuzzy sets, Properties of fuzzy sets, operations on fuzzy sets.Classical relations and fuzzy relations - cartesian product, crisp relation, Fuzzy relations, Tolerance and Equivalence Relations, Fuzzy tolerance and equivalence relations, operation on fuzzy relations, The extension principle.

(15)

MODULE – III

Membership Function: Features of membership functions, standard forms and boundaries, Fuzzification, Membership value assignment.

(3)

Fuzzy-to-Crisp conversions: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations. Defuzzification Methods

(2)

MODULE – IV

Classical logic and fuzzy logic: Classical predicate logic, Fuzzy logic, Approximate reasoning, Fuzzy tautologies, Contradictions, Equivalence, and Logical proofs, Implication operation, Composition operation.

(3)

Fuzzy Rule-Based Systems: Natural languages, Linguistic Hedges, Rule based systems, Graphical Techniques of Inference

(2)

MODULE – V

Fuzzy knowledge based controller (FKBC) Design Parameters: The structure of a FKBC, Rule base, Data base, Inference Engine, Choice of Fuzzification procedure, Choice of Defuzzification procedure.

(7)

MODULE – VI

Nonlinear Fuzzy Control: Introduction, The control problem, The FKBC as a nonlinear transfer element, types of FKBC.

(5)

MODULE – VII

Adaptive Fuzzy Control: Design and performance evaluation, The main approach to design.

(5)

Text Books:

1. “An Introduction to Fuzzy Control”, Dr. Driankov, H. Hellendoorn, & M. Reinfran, Narosa Publishing House (ISBN 81-7319-069-0).
2. Fuzzylogic with Engineering Applications - Timothy J. Ross, McGraw-Hill International Editions.
3. Fuzzy Sets and Fuzzy logic: Theory and Applications - George J. Klir and Bo. Yuan, Prentice-Hall of India Private Limited.

ELECTIVE

EE 8109	ARTIFICIAL INTELLIGENCE	1.0

MODULE – I

Introduction: Basic definitions and concept of Artificial Intelligence (AI) – Representations in AI – Properties of Internal representation – The predicate calculus – Indexing, pointers, Alternative notations etc.

(5)

MODULE – II

Lisp Language: LISP style – Atoms and Lists-Building up Lisp structure – Basic LISP Primitives – Definitions, Predicates, Conditionals and Binding – The FOR function – Recursion and Iteration – Association lists, Properties and Data Abstraction – Definition Using Lambda – Scope of Variables – Printing and Reading – Input/ Output Optional. Parameters, Macros and Backquote – List storage, survey and reclamation, etc.

(10)

MODULE – III

Parsing Language: Rules of syntax – Syntactic parsing (Top – Down and Bottom – up parsing, Transition Network Parsers) – The Interpretation of Definite Noun phrases – Case grammer and meaning of verbs syntactic use of semantic knowledge- organization of operating, etc.

(6)

MODULE – IV

Search: Search problems – search tree with state evaluation numbers – A general purpose search algorithm – Depth first and breadth first search algorithms – Function as data in LISP.

(5)

MODULE – V

Logic And Deduction: Using predicate calculus – forward chaining and unification – Skolenization – Backward chairing – Nonmonotonic reasoning.

(6)

MODULE – VI

Memory Organization And Deduction: The importance of memory organization and approaches – Data Dependencies – Reasoning Involving Time – Spatial Reasoning – Rule Based Programming.

(6)

MODULE – VII

Learning: Learning as Induction – Failure Driven Learning – Learning by being told.

(3)

Special Topics: Abduction and causation and evidence– Expert systems– AI and Robotics

(4)

Text Books:

1. Charnaik, Eugene and McDermott, Drew, “Introduction to Artificial Intelligence”, Addison-Wesley Publishing Co., Mento Park, California, U.S.A.
2. Winston, Patric Henry and Horn, Berthold K.P., “LISP”, Second Edition.
3. Artificial Intelligent System - Padhy, Oxford Publishers

ELECTIVE

EE 8111	ROBOTICS	1.0

MODULE – I

Introduction of Robotics: Evolution of Robots and Robotics. What is and what is not a robot. Robot classification. Robot specifications. Robot applications. Direct Kinematics: Coordinate frames; Rotations; Homogeneous coordinates; D-H representation; The Arm Equation.

(10)

MODULE – II

Inverse Kinematics: Inverse kinematics problem. General properties of solutions. Tool configuration. Robotic work cell.

(4)

MODULE – III

Workspace Trajectory and Trajectory Planning: Workspace analysis. Workspace envelope. Workspace fixtures. Pick and place operation. Continuous-path motion. Interpolated motion. Straight line motion.

(5)

MODULE – IV

Control of Robot Manipulators: Computed torque control; Near Minimum time control; Variable structure control; Non-Linear decoupled feedback control; Resolved motion and Adaptive control.

(4)

MODULE – V

Robotic Sensors: Different sensors in robotics: Range; Proximity; Touch; Torque; Force and others.

(3)

MODULE – VI

Robotic Vision: Image acquisition. Imaging geometry, Image processing: Preprocessing; Segmentation and Description of 3-D structures; Recognition and interpretation.

(8)

MODULE – VII

Robot Programming Languages: Characteristics of Robot level languages. Task level languages: Task planning; Problem reduction; Use of predicate logic; Robot learning; Expert systems.

(4)

Text books:

1. Fundamental of Robotics: Analysis and Control- Robert J. Schilling.
2. Robotics: Control, Sensing, Vision and Intelligence- K. S. Fu, R.C. Gonzalez and Lee.

Reference Books:

1. Robotics and Control – R. K. Mittal and I. J. Nagrath.

ELECTIVE

EE 8113	POWER SYSTEM DYNAMICS AND RELIABILITY	1.0

MODULE – I

Classification of Power System Stability: Introduction to Power system Stability classification, Small signal and Transient stability, Rotor angle & Voltage Stability

(5)

MODULE – II

Synchronous Machine Modelling: Synchronous Machine, Basic Equations, Generator operated as part of large power grid.

(5)

MODULE – III

Small Signal (Steady State) Stability: Small Signal (Steady State) Stability, Linearization, State matrix

(5)

MODULE – IV

Transient Stability Studies: Transient Stability Studies, Network performance equations, alternate solution techniques – Runga Kutta and Trapezoidal, Methods of improvement of transient stability

(7)

MODULE – V

The Basics of Power System Reliability: Characteristics of component failure, the general reliability functions, the exponential distribution, mean time to failure, mean time to failure.

(7)

MODULE – VI

Generation Reliability model: Two state Markov Model, Steady-state availability, Steady-state unavailability or forced outage rate (FOR), Capacity outage probability table (COPT), Recursive techniques, Loss of load probability (LOLP) and loss of energy expectation (LOLE) calculation.

(10)

MODULE – VII

Transmission system reliability evaluation and composite reliability evaluation: Average interruption rate method, The frequency and duration method, Stormy and normal weather effect, The Markov process approach, Two plant single load composite system reliability analysis.

(6)

Text Books:

1. Power System Control & Stability – P. Kundur
2. Power System Reliability Evaluation - Roy Billingtor.

Reference Books:

1. Electric Energy System Theory – O.I. Elgerd
2. Power system Analysis by Stevenson and Grainger
3. Power System Planning - R. L. Sullivan
4. Reliability Modelling in Electric Power Systems - J.Endrenyi

ELECTIVE

EE 8115 MODERN POWER SYSTEM OPERATION AND-CONTROL 1.0

MODULE – I

Introduction: Operating states, Preventive and emergency control, Megawatt-frequency and megavar-voltage interaction.

(3)

MODULE – II

Load Frequency Control: Introduction, Speed governing system and modelling, Turbine modelling, Generator-load modelling, Steady-state and dynamic response of ALFC loop, The secondary ALFC loop, Integral control.

(8)

MODULE – III

Multi Control Area System: Introduction, Pool operation, Two area systems, Modelling of tie line, Static and dynamic response of two area system, Tie-line bias control, Tie-line control, Digital electrohydraulic (DEH) control system, Implementation of DEH system.

(10)

MODULE – IV

Excitation System: Introduction, Elements of an excitation system, Types of excitation system, Digital excitation system

(5)

MODULE – V

Reactive Power Control: Introduction, Methods of voltage control, Power capacitors and its application to distribution and transmission system, Static var system.

(6)

MODULE – VI

Power System Security: Introduction, Factors affecting power system security, Introduction to contingency analysis.

(4)

MODULE – VII

Power System Restructuring: introduction, Regulation vs. Deregulation,Competitive Market for Generation, The Advantages of Competitive Generation, Electric Supply Industry Structure Under Deregulation in India. Restructuring Models

(6)

Text Books:

1. Electric Energy Systems Theory an Introduction - Olle I. Elgerd
2. Power Generation Operation and Control - A.J. Wood, B.F. Wollenberg

Reference Books:

1. Power System Deregulation by Loi Lei Lai
2. Power System Stability and Control - P. Kundur
3. Electric Power Distribution System Engineering - T. Goneen

ELECTIVE

EE 8117	BIO-ELECTRONICS INSTRUMENTATION	1.0

MODULE – I

Introduction, Medical instrumentation system Man instrumentation system, Brief idea of cardiovascular, Nurvous & respiratory system

(6)

Text Books:

1. Biomedical Instrumentation & Measurements by Cromwell.
2. Biomedical instrumentation by Dr. M. Arumugham
3. Medical electronics & Biomedical instrumentation by Rajaraw & Guha.

MODULE – II

Resting & action potential, Polarization & depolarisation, Propagation & action potential, Bioelectronic potential

(6)

Text Books:

1. Biomedical Instrumentation & Measurements by Cromwell.
2. Biomedical instrumentation by Dr. M. Arumugham
3. Medical electronics & Biomedical instrumentation by Rajaraw & Guha.

MODULE – III

Biopotential electrode, Active & passive transduces, biochemical transduces.

(7)

Text Books:

1. Biomedical Instrumentation & Measurements by Cromwell.
2. Biomedical instrumentation by Dr. M. Arumughan
3. Medical electronics & Biomedical instrumentation by Rajaraw & Guha.

MODULE – IV

ECG electrodes & leads, Measurement of blood pressure, blood flow & heart sounds.

(5)

Text Books:

1. Biomedical Instrumentation & Measurements by Cromwell.
2. Biomedical instrumentation by Dr. M. Arumughan
3. Medical electronics & Biomedical instrumentation by Rajaraw & Guha.

MODULE – V

Noninvasive instrumentation, Patient monitoring system, Electrical safety of patients in hospital, defi pace maker

(6)

Text Books:

1. Biomedical Instrumentation & Measurements by Cromwell.
2. Biomedical instrumentation by Dr. M. Arumughan

MODULE – VI

Amplifiers & recorders, Diathermy (Microwave) structure & ultrasonic), imaging system (X-ray, MRI & ultrasonic), lasers in medicine.

(8)

Text Books:

1. Handbook for Biomedical instrumentation by Khandpur.
2. Medical instrumentation by Rajarao.
3. Medical instrumentation (application & design) by Webstar.
4. Medical instrumentation by Carr & Brown

MODULE – VII

Antennas for biomedical application & Applicator, Biomedical DSP (elementary idea)

(3)

Text Books:

1. Antenna Theory & practice by R. Chatterjee
2. Biomedical digital signal processing by Wills J. Tompkin.

ELECTIVE

EE 8119	VLSI – DESIGN	1.0

MODULE – I

Circuits and System Representation: Behavioral, Structural and physical representation, Example of a triangular waveform generator and its behavioral, Structural and physical description.

MODULE – II

Basic CMOST Technology: Basic n-well CMOS Process, p-well process, Twin-tub process, Silicon on insulator, CMOS process enhancements, Metal interconnect, Polysilicon/refractory metal interconnect, Local interconnect, Circuit elements like resistors, Capacitors, EAROM, Bipolar transistors and thin film transistor.

MODULE – III

Layout Design Rules: Layer representations, CMOS n-well rules, Design rule backgrounder, Layer assignment, Latch-up problem, Latch-up triggering, Internal latch-up prevention techniques, Resistance estimation, Capacitance estimation.

MODULE – IV

Basic Physical Design of Simple Logic Gates: Investor, NAND and NOR gates, Complex logic gates layout, CMOS standard cell design, Gate array layout, Sea-of-gates layout, General CMOS logic gate layout guidelines, Layout optimization for performance, Transmission gate layout consideration, 2-input multiplexers, I/O structures, V_{oo} and V_{ss} pads, Output and input pads, Tristate and bi-directional pads, Miscellaneous pads.

MODULE – V

CMOS Analogue Design Method: Opamp design, Feedback and frequency compensation, Opamp as a comparator, Sample and hold, Analogue layout considerations, Transistor layouts, Centroid design, Capacitor matching, Resistor layout, Noise consideration.

MODULE – VI

CMOS Digital Design Methods: Structured design strategies, Hierarchy, Regularity, Modularity, Locality, Design options like PL, Reprogrammable gate arrays, XILINX PGA, Standard cell design, behavioural synthesis, RTL synthesis, Logic optimization, Structural to layout synthesis, Placement, Routing, Automatic placement example.

MODULE – VII

CMOS Subsystem Design: Single bit address, Bit parallel adder, Transmission gate adder, Asynchronous counter, Synchronous counter, RM, Finite state machines, Multilevel logic.

Text Books:

1. Principle of CMOS VLSI Design A System Perspective, Weste Neil HE and Eshraghian K, Pearson Education, 1993.

ELECTIVE

EE 8121	COMPUTER SYSTEM ARCHITECTURE	1.0

MODULE – I

Introduction: Review of logic circuits, Register transfer and micro operations, Basic computer organization and Design.

(6)

MODULE – II

CPU Organization: Processor bus organization –ALU - stack organization – Instruction formats, Addressing modes – Data transfer and Manipulation – Program Control – Microprocessor Organization – Parallel Processing.

(7)

MODULE – III

Microprogram Cotnrol Organization: Control Memory – Address sequencing – Microprogram example and sequencer – Microinstruction formats, Nanomemory and Nanoinstructions.

(8)

MODULE – IV

Arithmetic Algorithms: Unsigned algorithms (addition, subtraction, multiplication and division) - Booths algorithms – Division with signed 2's complement numbers – Floating point addition, subtraction, multiplication and division algorithms. Decimal multiplication and division algorithms

(10)

MODULE – V

Input-Output Organization: Brief outline of I/O devices, interface, channels and processors – serial and parallel interfaces.

(6)

MODULE – VI

Memory Organization: Semi conductor memory – Disk and tape memories – Cache and Associative memories – Virtual memory – Memory management techniques.

(8)

Text Books:

1. Mano, M. Morrs, "Computer System Architecture", Second Edition, Prentice-Hall of India Pvt. Ltd., New Delhi – 110 001
2. Hayes, John P., "Computer Architecture and Organization", Second edition, McGraw Hill.

ELECTIVE

EE 8123	INDIAN CONSTITUTION AND PROFESSIONAL- ETHICS	1.0

MODULE – I

Preamble to the Constitution of India: Evaluation of Constitution Law, Scope and Extent of Fundamental Rights under Part III - Details of Exercise of Rights, Limitations and Important Cases.

(8)

MODULE – II

Relevance of Directives Principles of State Policy under Part IV Significance of Fundamental Duties under part IV

(8)

MODULE – III

Union Executive, Governor, Chief Minister, Council of Ministers, Parliament & Supreme Court of India

(7)

MODULE – IV

State Executive, Governor, Chief Minister, Council of Ministers, Council of Ministers, Legislature of High Court.

(7)

MODULE – V

Constitutional provisions for scheduled castes & tribes, Women & children and backward classes. Emergency powers, Major constitutional Amendments. Electoral Process

(5)

MODULE – VI

Scope & aims of engineering ethics. Responsibility of engineers - Impediments to responsibility

(5)

MODULE – VII

Honesty, Integrity and reliability Risk safety & liability in engineering.

(5)

Text Books:

1. Durga Das Basu - Introduction to the constitution of India (students edition) Prentice-Hall, 19th/20th Edn., 2001.
2. V.N. Shukla : Constitution of India (Latest Edn.)
3. Engineering Ethics by Charles E. Harris, Michel, S. Pritchard & Michel J. Robins Thompson Asia, 2003-08-05.

Reference Books:

1. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.
2. Ethics Engineering by Mike W. Martin & Roland Schinzinger
3. Introduction to Engineering Ethics by Roland Schinzinger & Mike W. Martin, 2002.
4. Introduction to the Constitution of India by Barij Kishore Sharma, Prentice Hall of India, 2002.

ELECTIVE

EE 8125 SPECIFICATIONS & ESTIMATION OF ELECTRICAL-INSTALLATIONS 1.0

MODULE – I

Interior Wiring System: Different wiring systems, Comparison of the various systems, Choice of wiring systems.

(6)

MODULE – II

Adequate lighting, Earthing, Materials used for the electrification, Estimation of wiring installations.

(6)

MODULE – III

Power Installation: Load calculations, Wire size selection, Power circuit wiring materials used and their specifications

(6)

MODULE – IV

Estimation for motor installation, Pump-sets, Workshops and theatre

(6)

MODULE – V

Transmission And Distribution Lines: Planning and surveying, Applicable IE rules, Materials required for 400 KV, 11 KV and 400 V lines. Estimates of 400 KV, 11 KV lines and 400 Volts/230 Volts distribution system, Distribution transformer installation and estimation.

(8)

MODULE – VI

Specification: Importance of specification, ISI specification of alternators, Transformers, Induction motors, Circuit breakers, Panels for transformers, Overhead line conductors, Insulators.

(7)

MODULE – VII

Underground cables, Storage batteries and earthing electrodes

(6)

Text Books:

1. Surjit Singh, Electrical Estimating and Costing
2. Dharmpal Rai & K.R. Gangadhar Rao, Electrical Estimating & Energy Management

ELECTIVE

EE 8127 NEURO-FUZZY TECHNIQUES IN POWER SYSTEMS 1.0

MODULE – I

Limitations of Conventional Techniques of Direct and Gradient Based method, Introduction to advanced computing techniques and its advantages.

(4)

MODULE – II

Fuzzy Logic: Background, Uncertainty and imprecision, Uncertainty in information, Fuzzy sets and membership functions, Knowledge based systems for process control, Knowledge based controllers, Classical sets to Fuzzy sets, Properties of fuzzy sets, Operation on fuzzy sets, Classical relations and fuzzy relations.

(8)

MODULE – III

Membership Function: Features of membership function, Standard forms, Fuzzification, Membership value assignment, Fuzzy to crisp conversions, α-cuts for fuzzy sets, α-cut for fuzzy relations, Defuzzification methods.

(8)

MODULE – IV

LMS Algorithm: Wiener-Hopf equations steepest descent search method, LMS algorithm, Adaline, Learning curve.

(6)

MODULE – V

Supervised and Unsupervised Learning: Multilayer perceptrons, Backpropagation algorithm, XOR problem, Training modes, Introduction to unsupervised learning, Simple competitive learning.

(8)

MODULE – VI

Application of Neural Network: Load forecasting, Load flow analysis, Fault section estimation.

(4)

MODULE – VII

Application of Fuzzy Logic: Load forecasting, Economic load dispatch, Unit commitment.

(4)

Text Books:

1. Neural Networks - Simon Heykin
2. Electric Power Applications of Fuzzy Systems - E.L. Hawary, M.E., IEEE Press, 1998

Reference Books:

1. Fuzzy Sets and Fuzzy Logic - G. J. Klir/ B. Yuan
2. Intelligent System Application in Power Engineering - Loi Lei Lai
3. Artificial Neural Networks - K. Mehrotra, Mohan, S. Ranka

ELECTIVE

EE 8129	EHV POWER TRANSMISSION	1.0

MODULE – I

Mexwell's coefficients, Sequence inductance and capacitance, Charge Matrix, Effect of Ground wire.

(6)

MODULE – II

Surface Voltage-gradient on bundled conductors, Mangoldt's formula, Gradient factors & their use, Ground level electrostatic field of EHV lines.

(6)

MODULE – III

Power frequency over-voltage control, Series and shunt compensation, Generalised Constants of Compensated line, Static Var Compensators (SVC/SVS).

(7)

MODULE – IV

Switching over-voltages in EHV Systems

(6)

MODULE – V

Six-pulse Bridge circuit: waveforms and relevant equations, Twelve-pulse converter, Advantages of higher pulse number, Bipolar to monopolar operation, Converter performance with phase control, Commutation and effect of reactance.

(8)

MODULE – VI

Introduction to HVDC Transmission system, Economical advantages, Technical advantages, Critical distance, Submarine transmission.

(5)

MODULE – VII

Inverter, Equivalent circuit of HVDC system, Schematic diagram, Reactive power consideration in HVDC system, Harmonics, Filters in HVDC system.

(7)

Text Books:

1. Extra High Voltage AC Transmission Engineering (2nd Ed.) by R.D. Begamudre, Wiley Eastern Ltd.
2. HVDC Power Transmission Systems by K. Padiyar, Wiley Eastern Ltd.

Reference Books:

1. EHV AC and HVDC Transmission Engineering and Practices by S.S. Rao, Khanna Publications.

ELECTIVE

EE 8131	DIRECT ENERGY CONVERSION	1.0

MODULE – I

Introduction: Energy sources. Energy conversion chart. Direct Energy Conversion (DEC) devices. General representation of DEC devices.

(4)

MODULE – II

Thermoelectric Power Generation: Introduction. Thermoelectric effects. Thermodynamic analysis of Thermoelectric generator. Maximum thermal efficiency and maximum power output. Single stage and multistage generators. Thermoelectric materials. Applications.

(7)

MODULE – III

Fuel Cells: Introduction, Principle of fule-cell operation and different types of fuel-cells reactions. Electrochemical thermodo-dynamics, Relation of cell potential to thermodynamic variables. Cell efficiency. Polarization losses. Types of fuel cells. Performance characteristics, Applications

(7)

MODULE – IV

Solar Cells: Introduction, Basic theory of p-n junction photovoltaic converters. characteristics of solar radiation. Typical schematic representation of a solar cell and the idealized equivalent circuit. Basic characteristics, power and efficiency. Materials for photovoltaic conversion and cell fabrication. Silicon, Cadmium Sulphide and Gallium Arsenide cells. Applications. System design methodology.

(7)

MODULE – V

MHD Generator: Introduction. Gaseous conductors. Seeding. MHD equations. Operating range of an MHD duct. Different types of MHD generators. Thermodynamic analysis of linear constant velocity MHD generator. Electrical power output and efficiency. Adiabatic efficiency. Introduction to liquid MHD generator.

(10)

MODULE – VI

Fusion Power: Principles of fusion power production. Advantages of fusion power. Problems in achieving controlled thermonuclear reactions. Plasma confinement, heating and diagnostics. Fusion devices.

(5)

MODULE – VII

Wind Power: Introduction to Wind Power Generation

(5)

Text Books:

1. M.Ali Kettani, “Direct Energy Conversion”, Addison-Wesley, 1970.
2. S.W. Angrist, “Direct Energy Conversion”, Allyn & Bacon, Boston, 4th Edn, 1982
3. S.L. Soo, “Direct Energy Conversion”, Prentice Hall, 1968. 3