SEMESTER IV

APPLIED MATHEMATICS IV

UNIT I: (NUMERICAL METHODS)

Error Analysis, Solutions of algebraic and transcendental equations, method of false position, Newton – Raphson method and their convergence.

System of linear equations, Guass elimination method, Gauss seidel method, Crouts methods.

Numerical solution of ordinary differential equation by Taylors series method, Runge Kutta methods, Euler Modified method, Milne's predictor corrector method.

UNIT II: (THE Z – TRANSFORM)

Z – Transform, inverse Z – Transform, Relationship of the Fourier transform to Z – Transform, properties of Z – Transform, Convolution of two sequences, poles and zeros, the inverse form by partial fraction expansion, The Inverse Z – Transform by partial faraction expansion, The one sided Z – transform: Definition and properties, Solution of difference equations.

UNIT III: (RANDOM VARIABLE AND PROBABILITY DISTRIBUTION)

Random variables: discrete and continuous: probability density function; probability distribution function for discrete and continuous random variable joint distributions.

UNIT IV: (MATHEMATICAL EXPECTATION)

Definition of mathematical expectation, functions of random variables, The variance and standard deviation, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis.

UNIT V: (PROBABILITY DISTRIBUTIONS)

Dernoulli Distribution, Poisson distribution, Relation between Binomial and Poisson distribution, Normal distribution, Relation between Binomial and Normal distribution. The central limit theorem, Exponential distribution.

UNIT VI: (SPECIAL FUNCTIONS AND SERIES SOLUTION)

Series solution of differential equation by: Frahanius method, Sessel's function, Legendre's Polynomials, Recurrency relations, Rodrigue's formula, generating functions, orthogonal properties Jn (X) and Pn (X).

TEXT BOOKS:

1. Introductory methods of numerical analysis by S. S. Sastri.
2. Digital signal processing principle, algorithm and applications, 2nd Edition, by John P. Goaks, D. G. Manolakis for Z – Transforms.
3. Theory and Problems of Probability and statistics by A. R. Soiegal (McGraw Hill) Schaum Series.
4. Higher Engineering mathematics, B. S. Grewal.

DIGITAL CIRCUITS

1. Analog V/s. Digital systems, Transistor as a switch, Boolean Algebra, Boolean Identities, Logic Problems, Binary, Gray, Octal, Hex & ASCII codes, Gates and their truth tables, D Morgan's Laws, Sum of products & Product of Sums. Logic families: TTL, ECL, CMOS etc, Fan-in, Fan-out, propagation delay Properties.

2. Combinational logic-concepts, SSI, MSI & VLSI Circuits Classification Standard TTL, CMOS characteristics, Decoders, Encoders, Multiplexers, Demultiplexers, code converters, Characteristics of display devices, standard configuration of gates as SSI/MSI/LSI circuits.

3. Karnaugh Map, Simplification of sum of products and products of sum, solution to problems using K-Maps; conversion of Decoders/Mux into one another use of MUX as a function generator.

4. Introduction to Flip Flop, Latches, Concept of clock, Memories Organization with Flip Flop as basic cell, RAM, ROM, EPROM & EEPROM an overview, Master slave combination and conversion of one type to another type Flip Flops.

5. Excitation tables & introduction to sequential circuits, counters-synchronous/asynchronous. Different module counters with reset/clear facility Design of counters of arbitrary module with K-maps, Lock free counters.

6. Arithmetic Circuits-Adders, subtractors, (Half & Full). BCD adder/subtractor concept of ALU and its design. Integrated circuits version of multivibrators and their design parameters.

Books: -

1. Digital Logic and computer Design: Mano (PHI)
2. Digital Integrated Electronics – Herbert Taub McGraw Hill

3. Digital Electronic Principles-Malvino PHI
4. Palmer: Introduction to Digital System (Tata Mc Graw Hill)
5. Ryan: Digital Electronics (Tata Mc Graw Hill) Practical based on above syllabus
6. Digital circuits and Microprocessors: Herbert Taub

ELECTROMAGNETIC FIELDS

UNIT I:

Gradient, divergence & curl of a vector & their physical interpretation ,Divergence &stoke's theorems, their proof & validity fir vector field. Irrotational & solenoidal fields. The uniqueneness & Helmholtz Theorems.

UNIT II:

Electrostatic field, Coulomb' s low, Electric field for different charge distributions, Gauss law &its application. Electric potential for different charge distributions. Poisson's & Laplace Equation.

UNIT III:

Magnetic Field, Lorentz law, Bio _savert Law, Magnetic Field due to different current distributions. Gause law & Ampere's law. Magnetic vector potential for different current distributions. Len'z & Faraday's laws, Energy stored in magnetic field.

UNIT IV:

Electric scalar potential, solution of Laplace equation in two dimensions using method of separation of variables, displacement current. Maxwell's equations for time varying fields & their physical significance. Boundry conditions of the vector fields.

UNIT V:

Pointing vector theorem & its proof, uniform plane wave, wave equation & it's solution in free space, relation between E&H. Vector, intrinsic impedance, wave equation &their solutions & conducting &dielectric media.

UNIT VI:

Plane waves, normal & oblique incidence on a perfect conductor & dielectric, reflection &refraction, Snell's law' Brewster angle, polarization, linear, circular & elliptical.

Books:

1. Electromagnetic waves & radiating system -- By E.C JORDAN and K.G.Balmain
2. Principles and application of electromagnectic fields by Collins
3. Electromagnetic fields by Hayt
4. Masar: 2000 solved problem in electromagnetics

BASIC ELECTRICAL MACHINES

Unit 1:

Transformer: Single Phase and three phase-effect of loading, regulation, open circuit and short circuit tests, efficiency, all day efficiency, and parallel operation, Autotransformers.

Unit 2:

D.C. Generators, series, shunt and compound, commutator, armature EMF, armature reaction and commutation, equivalent circuit, characteristics, parallel operation, Applications.

Unit 3:

D.C. Motor: Series, shunt and compound, Base emf, characteristics, starting, speed control, applications.

Unit 4:

Three Phase Induction Motor: Principle of operation, type, torque and slip equivalent circuit, No load and Blocked rotor test starting speed control and applications.

Unit 5:

Single Phase Motors: Principle of operation of single-phase induction motor, starting methods, principle of a.c. series motor, Universal motor.

Unit 6:

Three Phase synchronous machines: Motor and Generator action synchronous impedance and excitation. Equivalent circuit, voltage regulation, starting of motor, effect of excitation variation in case of motor.

Books:

1. Electrical Machinery: Nagrath Kothari (TATA – McGraw Hill)
2. Electric Machinery: Fitzerald Kingsley.

3. EMEC Devices: Deltord (McGraw Hill)
4. Electrical Machines y Dr. P. K. Mukherjee and S. Chakravarti (Dhanpatrai).

ELECTRONIC ENGINEERING MATERIALS & COMPONENTS

UNIT I:

Dielectric, Properties of insulators in static fields, polarization, dielectric constant, dielectric behaviour of monoatomic & polyatomic gases, Liquids & solids, Polar & non – polar dielectrics, Clausius – Masotti equation, ferroelectric, peizo electric & pyroelectric materials.

UNIT II:

Dielectric properties of insulators in alternating fields, complex dielectric constant, dipolar relaxation, dielectric loss, loss tangent, dielectric breakdown, fixed and variable capacitors, electrolytic, paper, plastic, ceramic & mica capacitors used in electronic circuits, dielectrics used in cables & transformers.

UNIT III:

Conductivity of pure metals & alloys, temperature coefficient of Resistivity, high conductivity materials, high Resistivity materials, heating elements, fuses, contact materials, connectors, switches, heat sinks, solders, fixed variable resistors, non linear resistors, resistors used in electronic circuits, super conductivity, type I & II materials, high temperature superconductivity, applications of superconductivity.

UNIT IV:

Spin & orbital magnetic dipole moment of electron, di, para, Ferro, fermi & anti ferromagnetism, soft and hard magnetic materials, ferrites, magnetic cores of conductors, transformers, relays, electric machines & memory elements, magnetic tapes.

UNIT V:

Semiconductors, band gap, electron and hole mobilities purification and doping of semiconductors materials, characteristics of semiconductor devices, diodes, zener and breakdown diodes, tunnel diodes, varactors, transistors (BJT, FET, MOSFET, UJT), DIAC, SCR & TRIAC, hall effect devices.

UNIT VI:

Fabrication of linear & digital ICS, LSI, VLSIa, CMOS devices, Optoelectronics devices, LCD, LED, Phototransistors, Optical couplers, detectors, optical couplers, detectors, optical fibers, lasers.

TEXT BOOKS: -

1. A course in electrical engineering materials .
   S.P. Seth & A.V. Gupta, Dhanpatrai & Sons, New Delhi -6

2. Electronics components & materials.
   M.A. Joshi A.H. wheeler Eco. Allahabad 211001.

REFERENCE: -

1. Discrete Electronics Components .
   F. F.Mazda, Cambridge Univ, Press, NewYork.
2. Elect. Eng. Materials A.J. Dekker.