SEMMESTER 1

08O101 CALCULUS AND ITS APPLICATIONS

3 2 0 4

BASIC CONCEPTS: Limits and Continuity-Revision.

MAXIMA AND MINIMA: Maxima and minima of two variables, Constrained maxima and minima- Lagrange multiplier method.

INTEGRAL CALCULUS: Evaluation of multiple integrals, Change the order of integration, Application of multiple integrals to find area and volume- Applications to engineering problems. Beta and Gamma Integrals- Evaluation of definite integrals in terms of Beta and Gamma functions.


LINEAR DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER: Homogeneous linear equations of second order and higher order equations with constant coefficients. Euler-Cauchy equation, Non-homogeneous equations, Solution by variation parameter. - Applications to engineering problems.

VECTOR CALCULUS: Differentiation of vectors – Gradient, Divergence, Curl, Directional derivatives. Line ,Surface integrals- Statement of Green’s ,Gauss Divergence and Stoke’s Theorems- Applications to engineering problems.

Total 42

TEXT BOOKS:

REFERENCES:

08E102 APPLIED PHYSICS

(Also Common with 08C102/ 08M102/ 08L102/ 08Y102/ 08P102/ 08Z102/ 08A102/ 08T102/ 08I102/ 08B102/ 08D102/ 08U102)

3 0 0 3


Total 42

TEXT BOOKS:
REFERENCES:

08E103 APPLIED CHEMISTRY
(Also Common with 08L103/ 08Z103/ 08I103/ 08U103)

WATER: Hardness-harmful effects in various industrial application. Softening- Zeolite processes, demineralization process. Boiler troubles and remedies, removal of oils and silica, internal conditioning, treatment of water for municipal supply, break point chlorination, desalination by electrodialysis and reverse osmosis, water quality parameters and standards for drinking and construction - WHO and Indian standards. (10)


POLYMER AND PLASTICS: classification, functionality of monomers, molecular weight of polymer. Polymerization reactions – chain, condensation, copolymerization and co-ordination polymerizations, synthetic rubber, thermo plastics and thermosets, compounding of plastics, polymer processing by injection, extrusion and blow moulding techniques. Polymers for building industry-floorings, roofing, special coatings. (7)

THERMODYNAMICS: Temperature dependence of enthalpy – thermochemistry - curing of cement, second law of thermodynamics, entropy and second law, spontaneity of chemical reactions, properties of Gibbs free energy. Free energy and spontaneity, absolute entropy and third law of thermodynamics. (10)

ELECTROCHEMISTRY: Conductometric titrations – applications. Electrode potential, cells, Nernst equation, galvanic and concentration cells, pH and potentiometric titrations – applications. Determination of Laglier saturation index-importance. (5)

Total 42

TEXT BOOKS:

REFERENCES:

08O104 COMMUNICATION SKILLS IN ENGLISH

READING: Reading Practice on a variety of subjects to develop Reading skills such as identifying main ideas and using contexts for vocabulary. (General and semi-technical articles from Newspapers and Science Magazines) (10)

WRITING: Fundamental Principles of clear writing – Style and tone in formal writing with Exercises. (5)

MECHANICS OF WRITING: Grammar in context- focus areas – Tenses, Prepositions, Modals, Adjectives, Transformation of sentences. (7)

TECHNICAL WRITING: Definition, Description, Instructions, and Writing Technical Papers. (4)

TRANSCODING: Interpreting Graphics and Writing coherent paragraphs. (2)

Writing for focus (2)

MIND MAP: Organisation of Coherent Paragraphs and Essays, (2)

Cloze Test to improve Vocabulary, syntax and reading skills (4)

Letter Writing and Short reports (6)

9
PRACTICALS:

Short Speeches (10)
Group Discussions and Role-plays (8)
Listening Activities (10)

Total 70

TEXT BOOKS:
1. Teaching Material prepared by the Faculty, Department of English

REFERENCES:

08E105 PROBLEM SOLVING AND C PROGRAMMING
(Also Common with 08C105/08M105/08L105/08P105/08A105/08T105/08B105/08D105/08H105/08U105)

INTRODUCTION TO PROBLEM SOLVING: Program development - Analyzing and Defining the Problem - Modular Design - Algorithm-Flow Chart.

PROGRAMMING LANGUAGES: What is programming language - Types of programming language - Program Development Environment.


Arrays: Defining an array – Processing array – Passing array to a function – Multi dimensional array – Array & strings.

Pointers: Declarations – Pointers to a function – Pointer and one dimensional arrays – Operating a pointer – Pointer and multi dimensional arrays – Arrays of pointers – Passing functions to other functions.

STRUCTURES AND UNIONS: Definitions – Processing a structure – User defined data types – Structures and pointers – Passing structure to functions – Self referential structures.


Preprocessor Directives - Command Line Arguments.

Total 28

TEXT BOOKS:

REFERENCES:
08E106  ELECTRIC CIRCUITS


POWER: Power Triangle - Power Factor. (3)

MESH AND NODAL ANALYSIS: Loop Analysis - Mesh Equations for Circuits with Independent Current Sources – Mesh Equations for Circuits with Dependent Sources – Analysis using PSpice. (6)

NODAL ANALYSIS: Node Equations for Circuits with Independent Voltage Sources – Node Equations for Circuits with Dependent Sources – Analysis using PSpice. (6)

NETWORK THEOREMS: Superposition – Source Transformation – Thevenin’s and Norton’s Theorems – Maximum Power Transfer Theorem – Analysis using PSpice. (6)

RESONANCE: Resonance in Series and Parallel RLC Circuits – Bandwidth – Quality Factor – Selectivity. (8)

TEXT BOOKS:

REFERENCES:

08E110 ENGINEERING GRAPHICS
(Also Common with 08C110/08Y110/08Z110/08B110/08D110/08H110/08U110/08L210/08T210/08I210)

INTRODUCTION: Introduction to Engineering Drawing. BIS. Principles of dimensioning (5)

ORTHOGRAPHIC PROJECTION: Principles of orthographic projection-projection of points, straight lines, planes and solids. Orthographic projection of simple engineering components – missing view exercises. (10)

PICTORIAL PROJECTIONS: Principles of pictorial views, isometric view of simple engineering components. Orthographic views from given pictorial views. Isometric views from given two or three views. (5)

SECTION OF SOLIDS: Section of regular solids, types of sections, selection of section views. Sectional views of simple engineering components. (5)

DEVELOPMENT OF SURFACES: Development of lateral surfaces of regular solids and truncated solids. (5)

TEXT BOOK:

REFERENCES:
SEMESTER 2

08O201 LINEAR ALGEBRA AND FOURIER SERIES  3 2 0 4

LINEAR ALGEBRA: Euclidean n-space, General vector spaces, Subspaces, Linear independence, Basis and dimension, Row and column spaces, Rank, Finding bases, Inner product spaces, Length and Angle in inner product spaces, Orthonormal bases; Gram Schmidt process, Change of basis. (12)

LINEAR TRANSFORMATIONS: Introduction, Properties-Kernal and range, Linear Transformation from R^n to R^m, Matrices of linear transformations (7)

EIGEN VALUES AND EIGEN VECTORS: Eigen values and Eigen vectors, Diagonalization, Orthogonal Diagonalization, Symmetric Matrices, Quadratic Forms and its Applications. (7)

FOURIER SERIES: Dirchlet's conditions, Statement of Fourier theorem, Fourier coefficients, Change of scale, Half range series. (6)

BOUNDARY VALUE PROBLEMS: Separable partial differential equations-Classical equations and Boundary value problems, One dimensional wave equations, One dimensional heat equations, two dimensional heat equations - Solution by Fourier series. (10)

TEXT BOOKS:

REFERENCES:

Total 42

08E202 MATERIALS SCIENCE  
(Also Common with 08L202/ 08Z202/ 08I202/ 08U202 )  3 0 0 3

CRYSTALLOGRAPHY: Crystal systems. Lattice parameters, Bravais lattices. Packing Factors of cubic and HCP crystal systems. Miller indices. Linear and planar density of atoms. Debye - Scherrer method of crystal structure. Crystal Imperfections - point, line and surface defects and their role in electrical, mechanical and optical properties of materials. (8)


ADVANCED MATERIALS: Nanophase materials - Synthesis techniques, properties, applications. Shape Memory alloys (SMA) – Characteristics, properties of NiTi alloy, application in MEMS. Superconductivity. Types of superconductors - High Tc superconductors, comparison with low Tc superconductors. Application of superconductors. Metallic glasses – Preparation, properties, applications. (8)

TEXT BOOKS:

Total 42

REFERENCES:

08E203 CHEMISTRY OF ELECTRONIC MATERIALS
(Also Common with 08L203/ 08Z203/ 08I203/ 08U203 )

3 0 0 3

PRINCIPLES OF POLYMER SCIENCE: Polymerisation reactions— types-examples, degree of polymerization and average molecular weights. Thermoplastics and thermostetting resins - examples. Electrical, mechanical and thermal properties related to chemical structure. Insulating materials, polymer alloys, composites. (8)


ORGANIC ELECTRONIC MATERIALS: Charge transfer complexes, organic light emitting diodes, organic semiconductors and transistors- structure, stability and fabrication methods. (6)

ADVANCED MATERIALS: Carbon nanotubes and carbon fibres, fullerenes, polymer nano-composites, shape memory alloys, metallic glasses, solid oxide materials, Polymer electrolytes , super conducting oxides. (8)

PROCESSING OF ELECTRONIC MATERIALS: Zone refining for high purity silicon, Ceramics for electrical insulation and magnetic applications. Photo and electroluminescence materials. Materials for optic fibres. Principles and applications of PVD and CVD, MOVVD for optic fibre production. (10)

TEXT BOOKS:

REFERENCES:

08E204 NETWORK THEORY

2 1 0 2.5

THREE PHASE CIRCUITS: Phase sequence- Line and phase quantities - Phasor diagram - Balanced and unbalanced Wye, Delta loads – Analysis of balanced load - Analysis of unbalanced load - Neutral shift method. (5)

POWER MEASUREMENTS IN THREE PHASE CIRCUITS: Single and two Wattmeter methods – Balanced and unbalanced Wye, Delta loads - Power factor calculation - Reactive power measurements-PSPICE analysis of 3 phase circuits. (9)

MAGNETICALLY COUPLED CIRCUITS: Mutual inductance – Co-efficient of coupling - Dot convention - Analysis of coupled circuits, Ideal transformer, Ideal auto transformer - Analysis of single tuned and double tuned circuits - PSPICE analysis of coupled circuits. (8)

NETWORK TRANSIENTS: Transient concepts – Singularity functions – unit step, unit impulse - Transient response of simple RL, RC and RLC series and parallel circuits for step input and sinusoidal excitation - Laplace Transform application to the solution of RL, RC & RLC circuits: Initial and final value theorems and applications - concept of complex frequency - driving point and transfer impedance - poles and zeros of network function - Transient analysis using PSPICE (10)


FILTERS AND ATTENUATORS: Low pass, High pass, Band pass, band stop filters – constant K and m-derived filter – Attenuators – T type, π Type , Lattice attenuator (4)

NETWORK SYNTHESIS: Realisability concept – Hurwitz property - Positive realness - Properties of positive real functions - Synthesis of RL, RC and LC driving point impedance functions using simple canonical networks - Foster and Cauer forms. (6)

Total 42

13
**TEXT BOOKS:**


**REFERENCES:**


**TEXT BOOKS:**


**REFERENCES:**

CYCLE – II
1. Welding - Metal Arc Welding and Gas Welding.
3. Machine Tools II – Demonstration of CNC Lathe and Machining Center
5. Automobile Engineering – Study of Automobile and Power Transmission

REFERENCES:
Laboratory Manual, Prepared by EEE, ECE & Mechanical Department.

08E211 / PHYSICS LABORATORY
(Also Common with 08L211/08Z211/08I211/08U211)

0 0 3 1.5
(Annual)
1. Magnetic Hysteresis
2. Resistivity of Metals and Alloys - Carey Foster Bridge
3. Band gap of Semiconductor - Post Office Box
4. Efficiency of a solar cell
5. Band Gap of Semiconductor – Reverse Saturation Current
6. Electrical and Thermal conductivity of Metallic wire - Wiedemann Franz Law
7. Temperature Coefficient of Resistance - Post Office Box
8. Characteristics of Photo Diode
10. Demonstration of determination of laser parameters

REFERENCES:
Laboratory Manual, Prepared by Physics Department

08E212 CHEMISTRY LABORATORY
(Also Common with 08L212/08Z212/08I212/08U212)

0 0 3 1.5
(Annual)
1. Anodizing aluminium and determination of thickness of anodic film
2. Electroplating of nickel and determination of cathode efficiency
3. Constructing of a pH titration curve and estimation of strength of an acid
4. Estimation of acids in a mixture by conductometry
5. Potentiometric determination of Ferrous iron
6. Preparation and chemical etching of printed circuit boards
7. Determination of corrosion rate of steel in acid media by weight loss method
8. Determination of inhibitor efficiency on the corrosion rate of steel in acid media by weight loss method
9. Determination of total, permanent, Ca and Mg hardness of water.
10. Determination of conductivity, TDS, pH and alkalinity of water

DEMO EXPERIMENTS:
1. Glass transition temperature of polymers- DSC curves and discussion
2. Determination of corrosion rate by polarization method and discussion of Tafel plots

REFERENCES:
Laboratory Manual Prepared by Chemistry Department

08E213 CIRCUITS AND DEVICES LABORATORY

0 0 3 1.5
1. Verification of Ohm’s and Kirchhoff’s laws
2. Series and Parallel resonance circuits
3. Verification of Superposition theorem, Thevenin’s theorem and Maximum power transfer theorem
4. Three phase power measurement by two wattmeter method.
5. Transient analysis of RLC circuit using PSPICE.
6. Characteristics of diode and clipper circuits.
7. Characteristics of Zener diode and Zener voltage regulator.
8. Characteristics of BJT.
9. Application of BJT as an amplifier and switch.
10. Characteristics of JFET and MOSFET.
REFERENCES:

SEMESTER 3

08O301 TRANSFORMS AND COMPLEX ANALYSIS

3 2 0 4

TRANSFORM METHODS: Concept of Transformation – Examples for Transformation. (2)


COMPLEX VARIABLES: Analytic functions – Cauchy Reimann equations in Cartesian and polar – coordinates – Statement of sufficient conditions – properties of analytic functions – Finding analytic function whose real / imaginary part is given – conformal mapping , Bilinear map – study of mappings w = exp(z), sinz, cosz , sinh , cosh, 1/z, z+k/z – Complex integration – Cauchy’s fundamental theorem and formula- Taylor’s series – Laurent’s series (Statement only) – Singularities – Residue theorem – Cauchy’s lemma and Jordan’s Lemma (Statement only) – Evaluation of real integrals using contour integration along semi circle and unit circle. (12)

REFERENCES:

08O302 ECONOMICS FOR BUSINESS DECISIONS

3 0 0 3

INTRODUCTION TO ECONOMICS: Definitions – Scope and Significance of Economics in Decision Making – Various Economic Tools and Techniques. (2)

CALCULATING PERCENT CHANGE AND COMPOUNDED GROWTH RATES: Some Mathematical Concepts and Analytical Tools. (3)


MONEY AND BANKING: (Monetary Policy) Functions of Money - Value of Money - Objectives and instruments of Monetary Policy – Highlights of Current Monetary Policy – Banking – Types of Banks - Central Bank and Commercial Banks - Objectives and Functions of Central Bank and Various Types of Commercial Banks and Its Functions. (4)

ECONOMIC GROWTH: Meaning – Benefits and Costs of Growth. (2)

TEXT BOOK:

REFERENCES:

08E303 DIGITAL ELECTRONICS 2 2 0 3


DIGITAL LOGIC FAMILIES: Characteristics of digital ICs – Voltage and current ratings, Noise margin, Propagation delay, Power dissipation, TTL logic family – Totem pole, Open collector and tristate output, Wired output operations, LS, ALS and Fast sub families. MOS transistor switches – nMOS Inverter / Logic gate, CMOS logic, Inverter / logic gates. Multiplexers – High speed CMOS (74HC, 74HCT, 74AHC, 74AHC, 74AHC logic sub-families) and ECL logic families – Comparison of performance of various logic families. Interfacing TTL and CMOS devices. (6)


ARITHMETIC CIRCUITS: Binary / BCD adders and subtractors, Carry look ahead adder, Magnitude comparator, ALU. (8)

INTRODUCTION TO SEQUENTIAL DEVICES: General model of sequential circuits – Latch, Flip Flops, Level triggering, Edge triggering, Master slave configuration. Binary counters, Shift register, Ring counter, Johnson counter, Timing diagram. (6)


PROGRAMMABLE LOGIC DEVICES: Semicustom design. Introduction to PLDs – ROM, PAL, PLA, FPLA, FPLS. Architecture of PLDs – PAL 22V10, PLS 100/101, Implementation of digital functions. (5)


TEXT BOOKS:

REFERENCES:

08E304 MECHANICS FOR ELECTRICAL ENGINEERS  

2 0 0 2

STRUCTURAL ANALYSIS: Equilibrium of concurrent and coplanar forces – Forces in pinjointed plane frames and trusses – Cable having supports at different levels – Calculation of Sag. Length of cable and tension. (7)

SFD/BMD: Bending moment and shear force diagrams in simply supported, overhanging and cantilevers subjected to concentrated loads and UDL. (7)

AXIAL BENDING STRESSES: Stresses and strains – Hooke’s Law – Stresses and Strain in stepped bars – Concept of flexural stress qualitative aspect only – Flexure formula and design of rectangular beam section. (7)

TORSION: Concept of torsion and torsional shear stress – Torsion formula and design of circular shaft – Power transmitted section to carry torque. (7)

TEXT BOOKS:

REFERENCE:

08E305 ELECTRONIC CIRCUITS  

3 1 0 3.5


WAVE SHAPING: Response of High pass and Low pass RC circuit for sinusoidal, step, pulse, square, ramp and exponential inputs. Linear wave shaping–Integrator, Differentiator. Non-linear wave shaping–Clipping and clamping circuits, clipping circuit theorem and applications, Attenuator and compensated attenuator. Introduction to pulse transformers and applications. (8)


POWER AMPLIFIERS AND FEEDBACK AMPLIFIERS: Power amplifiers– Classification, Class A/B/C, Single ended and Push-pull Configuration, Power dissipation and output power, Conversion efficiency, Complementary symmetry power amplifiers, Class AB operation. Basic concepts of feedback amplifiers – Effect of negative feedback on input and output resistances, gain, gain stability, distortion and bandwidth. Voltage and current feedback circuits. (8)


TEXT BOOKS:

REFERENCES:
08E306 DC MACHINES AND TRANSFORMERS

DC GENERATORS: Laws of magnetic circuit – Principle of operation, Constructional details, Armature Windings, EMF equation, Methods of Excitation, Separate, shunt, series and compound excitations. (5)

No load characteristics – Armature reaction, Commutation, Interpoles, Compensating windings, Load characteristics of various types of DC Generators. (6)

DC MOTORS: Principle of operation – Torque equation, Electrical and Mechanical characteristics of DC shunt, series and compound motors. Starters – Speed control – Armature and field control – Braking. (6)

Losses and efficiency – Swinburne’s test – Separation of losses, Hopkinson’s test. (5)

TRANSFORMERS: Principle of operation – Constructional features, Classification of Transformers, EMF equation, Transformation ratio, Transformer on no-load and load, Phasor diagrams. (5)

Equivalent circuit - Voltage regulation, Regulation curve, Losses, Efficiency, All day efficiency (5)

Phasing out, polarity and voltage ratio tests – Open circuit and short circuit tests, Sumpner’s test. Separation of losses – Parallel operation (5)


TEXT BOOKS:

REFERENCES:

Total 42

08E307 ELECTROMAGNETIC FIELDS


ELECTROSTATIC FIELDS: Coulomb’s law – Electric field intensity, Determination of field due to point charge, line, surface and volume charge distributions, Electric flux density: Gauss’s law – Applications of Gauss’s law. Divergence theorem. Potential : Absolute potential – Potential difference, Potential calculation for different charge configurations, Potential Gradient: Electric Dipole.-Energy density in electrostatic field. (10)

ELECTRIC FIELDS IN MATERIAL SPACE: Properties of materials-convection and conduction currents -conductors – polarization in dielectrics- dielectric constant and strength - continuity equation and relaxation time- Boundary conditions involving conductors, dielectric, and free space. (5)

ELECTROSTATIC BOUNDARY-VALUE PROBLEMS: Poisson’s and Laplace’s equations-uniqueness theorem- Solution of Laplace’s equation of single variable only- resistance and capacitance determination-method of images. (5)

MAGNETOSTATIC FIELDS: Biot Savart’s law - Ampere’s circuital law –Stokes’ theorem, Magnetic flux density, Scalar and Vector magnetic potentials-Maxwell’s equations for static EM fields. (5)

MAGNETIC FORCE: Forces due to magnetic fields-magnetic torque and moment-Force and Torque on a closed circuit- Magnetic Materials- Boundary conditions at the interface of two different magnetic materials. (5)


TEXT BOOKS:

Total 42
REFERENCES:

08E310 ELECTRONIC CIRCUITS AND DIGITAL LABORATORY
0 0 3 1.5

1. Response of low pass and high pass RC circuits for pulse and square input signals
2. Design of series voltage regulator
3. Design of RC coupled amplifier
4. Design of Class B Push Pull amplifier
5. Design of Oscillators.
6. Study of Basic Digital ICs and Implementation of Adder and Subtractor circuits
8. Design and Implementation of Counters and registers using suitable ICs
9. Study of Multiplexer and Demultiplexer.
10. Design of Synchronous sequential circuit.

REFERENCES:
Laboratory Manual, Prepared by EEE Department

08E311 DC MACHINES AND TRANSFORMERS LABORATORY
0 0 3 1.5

1. Load Characteristics of DC Shunt and Compound Generator.
2. Load Characteristics of DC Shunt and Compound Motor.
3. Load Test on DC series motor
4. Hopkinson’s Test.
5. Sumpner’s Test.
7. Load Test on 1-Phase Transformer.
8. Open circuit and Short circuit Tests on 1 Phase transformer
9. Sumpner’s Test on a single Phase Transformer.
10. Phase relation test of a three phase transformer

REFERENCES:

SEMESTER 4

08E401 LINEAR INTEGRATED CIRCUITS
2 2 0 3

OPERATIONAL AMPLIFIER CHARACTERISTICS: Functional Block Diagram – Symbol, Characteristics of an ideal operational amplifier, Circuit schematic of µA 741, Open loop gain, CMRR-input bias and offset currents, input and output offset voltages, offset compensation techniques. Frequency response characteristics – stability, limitations, frequency compensation, slew rate. Transfer characteristics. (6)


NON LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS: Comparator – Regenerative comparator, Zero crossing detector, Window detector, Sample and hold circuit, Precision diode, Half and Full wave rectifiers, Active peak detector, Clipper and Clamper, Logarithmic and Exponential amplifiers, Multiplier and Divider, Square and Triangular waveform generators. (6)

SINGLE POWER SUPPLY OPERATIONAL AMPLIFIERS: Need for single power supply operational amplifiers – LM324, AC Inverting and Non-Inverting amplifiers. Norton Amplifiers – Various configurations. (2)

IC VOLTAGE REGULATORS: Block diagram of 723 general purpose voltage regulator – Circuit configurations, Current limiting schemes, Output current boosting, Fixed and adjustable three terminal regulators, Switching regulators. (6)

SPECIAL FUNCTION ICs: 555 Timer Functional block diagram and description – Monostable and Astable operation, Applications, 568 Voltage Controlled Oscillator, Analog Multiplier, Comparator ICs. PLL Functional Block diagram – Principle of
operation, Building blocks of PLL, Characteristics, Derivations of expressions for Lock and Capture ranges, Applications: Frequency synthesis, AM and FM detection, FSK demodulator, Motor speed control.

A-D and D-A CONVERTERS: DAC/ADC performance characteristics – Digital to Analog Converters: Binary weighted and R-2R Ladder types – Analog to digital converters: Continuous, Counter ramp, Successive approximation, Single slope, Dual slope and Parallel types

TEXT BOOKS:
Prentice Hall of India, New Delhi.

REFERENCES:

08E402 PRINCIPLES OF COMMUNICATION ENGINEERING 2 0 0 2


FIBRE OPTIC SYSTEM: History of fibre optics-optical fibres versus metallic cables-optical fibre communication system-light propagation through optical fibres-fibre configurations-acceptance angle and acceptance cone-losses in optical fibre cables, light sources, light detectors, lasers.

ADVANCED COMMUNICATION SYSTEMS: Introduction to cellular radio telephones, Wireless Access methods, Wireless LAN – Introduction to ISDN and BISDN.

TEXT BOOKS:

REFERENCES:

08E403 MEASUREMENTS AND INSTRUMENTATION 3 0 0 3


**TEXT BOOK:**

**REFERENCES:**

**08E404 C++ AND DATA STRUCTURES**


**FUNCTIONS IN C++:** Function Prototyping - Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function - Overloading - Friend and Virtual Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function - Arguments - Friendly Functions - Returning Objects - Const Member functions - Pointers to Members.

**CONSTRUCTORS:** Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors – Destructors overloading - Overloading Unary and Binary Operators - Overloading Binary Operators using Friend functions.

**INHERITANCE:** Defining Derived Classes - Single Inheritance - Making a Private Member Inheritable - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Base Classes - Abstract Classes - Constructors in Derived Classes - Member Classes - Nesting of Classes.

**DATA STRUCTURES:** Abstract data Types - Primitive data structures - Analysis of algorithms - Best, worst and average case time complexities - Notation.

**ARRAYS:** Operations - Implementation of one, two, three and multi dimensioned arrays – Sparse and dense matrices - Applications.

**STACKS:** primitive operations - Sequential implementation - Applications: Subroutine handling - Recursion.

**QUEUES:** Primitive operations - Sequential implementation - Dequeues - Applications: Image component labeling; Machine shop simulation.

**LISTS:** Primitive Operations - Singly linked lists, Doubly linked lists, Circular lists, Multiply linked lists - Applications Addition of Polynomials; Sparse Matrix representation and Operations. – Linked Stacks - Linked queues.

**TEXT BOOKS:**
REFERENCES:

08E405 INDUCTION AND SYNCHRONOUS MACHINES

Equivalent circuit – Phasor diagram – Performance calculation from circle diagram - Induction Generators – Testing. (6)


Load characteristics – Power expression – Parallel operation – Synchronising and synchronising power – Active and reactive power sharing – Alternator on infinite Busbar – General load diagram. (6)


Total 42

TEXT BOOKS:

REFERENCES:

08E410 LINEAR ICs AND MEASUREMENTS LABORATORY

2. Waveform Generation using OpAmp (Square, Rectangular, Triangular and Sinusoidal)
3. Performance characteristics of Voltage Regulator ICs
4. Study of 555 Timer and 566 VCO
5. Design and Implementation of Active Filters.
6. Three Phase power measurement by two wattmeter method
7. Extension of instrument ranges
9. Linear variable differential transformer and strain gauge
10. Wheatstone bridge and Kelvin’s Double Bridge.

REFERENCES:
Laboratory Manual, Prepared by EEE Department

08E411 AC MACHINES LABORATORY

1. Load Test on 3-Phase Induction Motor
2. No load Test and Blocked Rotor Test on 3-Phase Induction Motor.
3. Electrical Braking of 3-Phase Induction Motor
4. Load Test on 1-Phase Induction Motor
5. Regulation of Alternator by Synchronous Impedance and MMF Methods.
6. Regulation of Alternator by ZPF Method
7. Regulation of Alternator by Bus bar Loading
8. V and Inverted V Curve of Synchronous Motor
9. Load test on 3 - Phase Induction Generator
10. Regulation of Salient Pole Alternator by Blondel’s Method

REFERENCES:

SEMESTER 5

08E501 ENVIRONMENTAL SCIENCE AND ENGINEERING

( Also Common with 08L601/08Z601/08I601/08D701/08M701/08P701/08Y701/08T701/08A701/08B701)

3 0 0 3


OTHER ENVIRONMENTAL POLLUTIONS: Definition – Causes, effects and control measures of: Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial solid wastes - Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water Act – Introduction to EIA and ISO 14000


TEXT BOOKS:

REFERENCES:

08E502 CONTROL SYSTEMS

3 1 0 3.5

INTRODUCTION: Open loop and closed loop systems – Examples, Control system components.

SYSTEM REPRESENTATION: Transfer function of physical systems– Mechanical systems, Translational and Rotational systems, Electrical network, Thermal and hydraulic systems. Transfer function of DC Generator, DC servomotor, AC servomotor and Synchro, Transfer function of overall systems, Impulse Transfer function. Block diagram - reduction techniques. Signal flow graphs – Mason’ gain formula.

FREQUENCY RESPONSE ANALYSIS: Frequency domain specifications – peak resonance, resonant frequency, bandwidth and cut-off rate, correlation between time and frequency responses for second order systems. Polar plot, Bode plot – Gain Margin and Phase Margin.


COMPENSATOR DESIGN: Lag, Lead and Lag-Lead Compensator design using frequency response method.

ROOT LOCUS: Root locus concept, Rules for construction of root loci, problems, stability analysis.

STATE VARIABLE ANALYSIS: Introduction to state space analysis – Physical variable, Phase variable and Canonical variables forms. Transfer function from state space representation.

REFERENCES:

TEXT BOOKS:

REFERENCES:
2. The MCS 80 / 85 Family User’s Manual, INTEL

08E503 MICROPROCESSORS AND MICROCONTROLLERS


MEMORY INTERFACING: Interface requirements – Address space partitioning – Buffering of Buses – Timing constraints – Memory control signals – Read and write cycles – Typical EPROM and RAM Interfacing.


REFERENCES:
08E504  POWER ELECTRONICS

POWER SEMICONDUCTOR DEVICES: Introduction - Power Diodes - Power Transistors - Power MOSFETs - IGBTs - Thyristor family: SCRs, Triacs, GTOs, MCT and IGCT - Static and Dynamic characteristics - Protection circuits - Series and parallel connections.

AC TO DC CONVERTERS: Diode rectifiers: single phase and three phase diode bridge rectifiers with R, RL and RLE load - Estimation of average load voltage and average load current - Free wheeling diode, Controlled rectifiers: Single phase and three phase half wave Thyristor converters. Estimation of average load voltage and average load current. Single phase half controlled and fully controlled Thyristor bridge converters - Estimation of average load voltage and load current for continuous current operation - Input power factor estimation for ripple free load current - Three phase half and fully controlled Thyristor converters (no analysis) - Dual converters.

AC TO AC CONVERTERS: Single phase full wave controller with R and RL load - Estimation of RMS load voltage, RMS load current and input power factor - Three phase AC voltage controllers (No analysis) - Single phase to single phase cycloconverters.

DC TO DC CONVERTERS: Principle of step up and step down operation - Single quadrant DC chopper with R, RL and RLE load - Time ratio control - Estimation of average load voltage and load current for continuous current operation - Two quadrant and four quadrant DC choppers.

DC TO AC CONVERTERS: Types - Voltage source and current source inverters - Single phase bridge inverters - Three phase bridge inverters - Control of AC output voltage - Harmonic reduction - Single phase series inverters.

CONTROL CIRCUITS: Functional requirements of the switching control circuits - Generation of control signals for single phase AC to DC converters - Cosine wave crossing control, ramp comparator approach. Generation of timing pulses for DC choppers - PWM techniques for DC to AC converters - Introduction to power converter control using microprocessors, microcontrollers and DSP.

APPLICATIONS: UPS – Selection of UPS – battery charging circuit-SMPS- HVDC systems - Tap changing of Transformers.

TEXT BOOKS:

REFERENCES:

08E505  COMPUTER ARCHITECTURE

INTRODUCTION: Register transfer language-register, bus and memory transfers–Arithmetic, logic and shift micro operations.


CENTRAL PROCESSOR ORGANISATION: General register organisation – Stack organisation – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – Control memory – Address sequencer – Data path structure - CISC characteristics, RISC Characteristics, RISC pipeline.

ARITHMETIC PROCESSING: Introduction – Addition, Subtraction, Multiplication and Division algorithms – Floating point Arithmetic operations - BCD Arithmetic operations.


INTRODUCTION TO PARALLEL PROCESSING: Parallelism in uniprocessor systems – Taxonomy of architectures – SISD, SIMD, MISD, MIMD modes of Memory access - shared memory, distributed memory – typical applications.

TEXTBOOK:
REFERENCES:

08E510 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

1. Study of 8085 Microprocessor kit
2. Multi byte Binary Addition and Subtraction in 8085
3. Multi byte BCD Addition and subtraction in 8085
4. Table Processing using 8085
5. Multiplication and Division in 8085
6. Interfacing with 8085
   a) Waveform Generation using 8255
   b) Display unit
7. Addition and subtraction in 8051
8. Multiplication and Division in 8051
9. Programming 8051 on chip peripherals
10. Interfacing Stepper motor with 8085/8031

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E511 POWER ELECTRONICS LABORATORY

1. Characteristics of MOSFET, IGBT, SCR and TRIAC
2. Single Phase and Three Phase Diode Bridge Rectifier with R and RL Load
4. DC Chopper with R and RL Load
5. Single Phase AC Voltage Controller with R and RL Load
6. Construction and testing of Ups using Inverter
7. Three Phase PWM Inverter
8. Three Phase AC Voltage Controller with R and RL Load
9. Three Phase Fully Controlled Thyristor converter

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E512 INSTRUMENTATION AND CONTROLS LABORATORY

1. Transfer function of DC Motor. a) Armature Control Mode. b) Field Control Mode.
2. Transfer function of AC Servomotor and Study of Synchros.
3. Time & Frequency Response of the System Using MATLAB.
4. Study of response of first and second order system using linear system simulator.
5. Study of response of 2nd order system with PID Controller using Simulink
7. Measurement of linear displacement using LVDT.
9. Study of characteristics of inductive and capacitive transducers.
10. Study of characteristics of Piezo electric transducer.
11. Measurement of physical variable with the help of LAB View.

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E520 MINI PROJECT I

- Problem Identification
- Project specifications
- Implementation ( Hardware / Software / both )
- Testing and validation of the developed system.
- Consolidated report preparation
SEMESTER 6

08E601 ELECTRICAL MACHINE DESIGN
2 2 0 3

GENERAL ASPECTS: Major considerations – Limitations - Main dimension- Output equation - Choice of specific electric and magnetic loadings - Separation of D and L for rotating machines.

MAGNETIC CIRCUIT CALCULATIONS: MMF for air gap - Effects of slots, ventilating ducts and saliency - MMF for teeth - Total mmf calculation - Leakage reactance.

ELECTRIC CIRCUIT CALCULATIONS: Estimation of number of conductors / turns - Coils - Slots - Conductor dimension - Slot dimension.

DC MACHINES: Choice of number of poles - Length of air gap - Design of field system, Interpoles, Commutator and Brushes.

TRANSFORMERS: Classification – output equation - Core section - Window dimensions - Yoke dimension - Overall dimension - No load current calculation – Temperature rise of Transformers- Design of tanks and cooling tubes.

THREE PHASE INDUCTION MACHINES: Length of air gap - Cage rotor - End ring current - Wound rotor - Dispersion coefficient.


COMPUTER AIDED DESIGN: An Introduction

TEXT BOOKS:

REFERENCES:

08E602 OPERATING SYSTEMS
3 0 0 3

INTRODUCTION: Operating system – Function – Evolutions of Operating System- Serial processing- Batch Processing-Multiprocessing-Time sharing, Advanced Operating Systems –Need for advanced OS-Distributed OS – Multiprocessor OS – Database operating system – Real time OS-Introduction to CSP, MPI and PVM.


CASE STUDIES:


TEXT BOOK:

Total 42
REFERENCES:

08E603 HEAT ENGINES AND FLUID MACHINERY

HEAT ENGINES: Steam power plant – Layout of modern steam power plant, principle of operation of modern high pressure boilers, condensers, cooling towers, draught system, steam turbines – impulse type, reaction type. Principles of operation of Gas turbine.

IC Engines – Principles of operation, 2 stroke and 4 stroke engines, Petrol and Diesel engines. Carburetor, Electronic fuel injection, Diesel injection system, Ignition system, cooling and lubrication method.

Performance characteristic of constant speed engines- Port timing and Valve timing diagram, calculation of fuel consumption, output power, mechanical and thermal efficiencies, Selection of engines.


FLUID MACHINERY: Introduction – Layout of hydroelectric power plant, classification of turbines, energy transfer between fluid and rotor. Specific speed & its significance.

Hydraulic turbines – impulse type, Pelton wheel, reaction type, Francis, Kaplan and Propeller – Principle of operation, performance of turbines, draft tube.

Hydraulic pumps – classification, Reciprocating and centrifugal pumps, performance studies, fluid coupling and torque converter.

Compressors – classification, Reciprocating and centrifugal compressors, applications, characteristics, Surging and stalling.

TEXT BOOKS:

REFERENCE:

08E604 GENERATION, TRANSMISSION AND DISTRIBUTION


POWER TRANSMISSION SYSTEMS: Various systems of transmission – Advantages of high transmission voltages - Comparison of conductor materials required for various overhead systems.

OVERHEAD LINES PARAMETERS: Electrical constants - Resistance, Inductance and capacitance of Single and 3 Phase lines - Effects of earth on capacitance - Skin effect - Proximity effect - Transposition - Bundled conductors - Line supports.

PERFORMANCE: Short and medium transmission lines - Phasor diagrams - Nominal T and Pi methods - Line regulation - Efficiency, Rigorous solution for long line - ABCD constants - Ferranti effect - Tuned power lines - Surge impedance and surge impedance loading.
LINE INSULATORS: Types - Potential distribution over a string of suspension insulators - Methods of increasing string efficiency. Corona – Factors affecting corona - Stress and Sag Calculation – Effect of wind and ice - supports at different levels – Stringing chart. (6)

UNDERGROUND CABLES: Types - Capacitance and insulation resistance - Sheath effects - Grading - Stresses - Loss angle - Breakdown voltage - Optimum cable length - Comparison between overhead lines and underground cables. (6)

DISTRIBUTION SYSTEMS: Feeders, distributors and service mains - Radial and ring main systems - Calculation of voltage in distributors with concentrated and distributed loads, A.C. single phase and three phase distribution systems. (6)

TEXT BOOKS:

REFERENCES:

08E605 DIGITAL SIGNAL PROCESSING


DESIGN OF DIGITAL FILTERS: Characteristics of IIR and FIR filters – Design techniques for analog filters-frequency transformation-FIR filter design: windowing, frequency sampling and optimal methods- IIR filter design: impulse invariant and bilinear Z transform- Realization structures of filters: direct form, cascade, parallel, and lattice and ladder realization. (10)

FINITE WORD LENGTH EFFECTS: Finite word length effects in IIR and FIR filters – A/D quantization noise – Co-efficient quantization – overflow errors – Product round off errors-limit cycle due to product round off errors – Finite word length effects in FFT implementation. (8)


TEXT BOOKS:

REFERENCES:

08E610 HEAT ENGINES AND FLUID MACHINERY LAB

1. Experimental Study of Valve Timing Diagram on Four Stroke IC Engines.
2. Experimental study of port timing diagram on two stroke IC engines
5. Experimental Study on Variable Speed IC Engines.
6. Performance Test on Centrifugal Pumps.
7. Performance Test on Positive displacement pumps.
8. Load Test on Impulse Water Turbine.
9. Load Test on Reaction Water Turbine.

REFERENCES:
Laboratory Manual Prepared by Mechanical Department

08E611 DIGITAL SIGNAL PROCESSING LABORATORY
0031.5
1. Generation of DT signals and determination of impulse response of LTI systems
2. Implementation of overlap save and overlap add methods of convolution
3. Determination of frequency response of LTI systems
4. Spectral analysis of DT signals
5. Implementation of FFT algorithm.
6. Design of IIR filters by BLT method
7. Design of IIR filters by Impulse Invariant method
8. Design of FIR filters using windows
9. Design of FIR Filters by optimal method

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E620 MINI PROJECT II
0021
- Problem Identification
- Project specifications
- Implementation ( Hardware / Software / both )
- Testing and validation of the developed system.
- Consolidated report preparation

08E621 INDUSTRIAL VISIT CUM LECTURE
1022
Industrial Lecture
Faculty will arrange for lectures by experts preferably from industries to highlight the recent technical and soft skill trends.
Visit to Industries
Study tour / Industrial visit. Reports are to represent the observations of the students after the visits with their personal comments / suggestions.

SEMESTER 7
08E701 ELECTRIC DRIVES AND CONTROL
3003
INTRODUCTION TO ELECTRIC DRIVES: History and development of electric drives, Characteristics of Electrical & mechanical loads, Classification of electric drives, Basic elements & advantages of variable speed drives. Modes of operation, closed loop control of drives - Selection of power rating for drive motors with regard to thermal overloading and load variation.
(7)

(9)

AC DRIVES: Speed control of 3 phase Induction Motors - Stator control: PWM & V/f control, rotor control: Rotor resistance control - Static control of rotor resistance using DC chopper - Static Krammer and Scherbius drives – Introduction to Vector Controlled Induction Motor Drives - Speed control of 3 phase Synchronous Motors - True synchronous and self controlled modes of operations
(9)

RELUCTANCE MOTOR DRIVES: DC servo drives principle of operation - AC servo drives principle of operation - Principle and control Stepper motor and SRM drives.
(8)

TEXT BOOKS:

REFERENCES:

08E702 COMPUTER AIDED POWER SYSTEM ANALYSIS

INTRODUCTION: Need for system analysis in planning and operation of power system- One line diagram- Per unit representation - Symmetrical components - short circuits analysis for fault on machine terminals.


SHORT CIRCUIT STUDIES: Types of faults - Algorithms for fault calculations — sequence impedance matrices - Symmetrical and unsymmetrical fault analysis using Zsub.


ECONOMICAL OPERATION OF GENERATING STATIONS: Optimal operation of generators — economical scheduling of thermal plant with and without transmission losses – Loss formula derivation- unit commitment - Elementary idea of optimal load scheduling of Hydro - Thermal plants.


Total 42

TEXT BOOKS:

REFERENCES:

08E703 ENERGY SOURCES AND UTILISATION

INTRODUCTION: Trends in energy consumption - World energy scenario - Energy sources and their availability - Conventional and renewable sources - Need to develop new energy technologies


Total 32

ELECTRIC TRACTION: Requirements of traction system - Systems of traction - Comparison of electric traction and other forms of traction - Systems of track electrification - Comparison - Types of services - Speed - Time curves - Tractive effort - Power of traction motor - Specific energy consumption - Current collection systems - Motors for traction - Starting and speed control - Electric braking. (6)


ELECTROLYSIS: Review of electrolytic process principles - Laws of electrolysis - Electro plating. (2)


Total 42

TEXT BOOKS:

08E704 POWER SYSTEMS PROTECTION AND SWITCH GEARS

INTRODUCTION: Principles and need for protective schemes – nature and cause of faults – types of fault – per unit representation - analysis of symmetrical fault – current limiting reactors. CTs and PTs and their applications in their protection schemes. (5)

PROTECTIVE RELAYS: Definition - Requirement of relays - Universal relay torque equation - Non directional and directional over current relays – Earth fault relays - Distance relays - Impedance, Mho and Reactance relays - Differential relays - Negative sequence relays - Pilot (Translay) relay – Power line carrier communication - Carrier and Microwave pilot relays – Under frequency relays - Introduction to static relays - Microprocessor and computer based protective relaying. (9)

APPARATUS AND LINE PROTECTION: Alternator, transformer, Busbar and motor protection using relays – Feeder Protection – radial and ring main system. Microprocessor based protective schemes. (7)

CIRCUIT BREAKERS: Functions of switchgear - Elementary principles of arc extinction - Arc control devices - Recovery voltage and restriking voltage - current chopping and capacitance current breaking - Bulk oil, low oil, air break, air blast, and sulphur hexafluoride and vacuum circuit breakers - HVDC breakers - Rating - Testing of circuit breakers. (7)

SURGE AND SURGE PROTECTION: Switching surges - Lightning phenomenon – Traveling waves on transmission lines - Over voltage due to lightning - Protections against lightning - Lightning arresters – Types - Lightning arrester selection - Surge absorbers. (7)

EARTHING AND INSULATION CO-ORDINATION: Solid, resistance and reactance Earthing - Arc suppression coil - Earthing transformers – Earth wires - Earthing of appliances- Insulation co-ordination: Definition - Determination of line insulation - Insulation levels of sub-station equipment - Co-ordination amongst items of substation equipment - Introduction to Indian Electricity rules. (7)

Total 42
REFERENCES:

08E710 POWER SYSTEMS LABORATORY 0 0 3 1.5
1. Computation of Line Parameters and modelling of transmission lines
2. Formation of a bus admittance matrix (YBus) using singular transformation method.
3. Determination of a bus impedance matrix (ZBus) using building algorithm.
8. Economic Load Dispatch of thermal power plants.
9. Transient stability analysis of power systems using PSCAD.
10. Characteristics of over current / Thermal overload relays.

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E711 DESIGN LABORATORY 0 0 3 1.5
1. Cross sectional 2D view of Electrical Machines using AUTOCAD
2. Effect of air gap variation for 3-phase induction motor
3. Measurement of illumination for different types of lamp
4. Closed loop speed control of DC Motor using SIMULINK
5. 8086 Assembler Programming
6. Solar Cell Characteristics
7. Load test on Variable Frequency Drive
8. Interfacing Digital I/O card with IBM PC
9. CAD of Electrical Machines (DC/AC Machines)
10. Performance analysis of special machines using MotorPro

REFERENCES:
Laboratory Manual Prepared by EEE Department

08E720 PROJECT WORK I 0 0 6 3
❖ Identification of a problem.
❖ Literature survey of identified problem.
❖ Finalization of project specification and requirements
❖ Presentation / Demonstration of sub block(s) of the Project ( Hardware / Software / both )

SEMESTER 8

08E820 PROJECT WORK II 0 0 24 12
❖ Project Implementation ( Hardware / Software / both )
❖ Presentation / Demonstration about the work done
❖ Consolidated report preparation

ELECTIVES

MATHEMATICS

08O001 APPLIED NUMERICAL ANALYSIS 3 1 0 3.5

TYPES OF ERRORS: Different types of errors (2)

SOLUTION OF ALGEBRAIC EQUATIONS: Newton Raphson method, Modified Newton Raphson method, Method of false position, Graffe’s root squaring method, Bairstow’s method. (6)
OPTIMIZATION: One dimensional unconstrained optimization–Golden-Section search, Quadratic Interpolation, Newton’s method.


FINITE DIFFERENCES AND INTERPOLATION: Finite difference operators – \( E, \Delta, \nabla, \delta, \mu, D \). Interpolation–Newton-Gregory forward and backward interpolation, Lagrange’s interpolation formula, Newton divided difference interpolation formula. Solution of linear second order difference equations with constant coefficients.


MATLAB: Matlab – Tools kits – 2D Graph plotting, 3D Graph plotting, Data analysis.

REFERENCES:

080002 BUSINESS STATISTICS

FREQUENCY DISTRIBUTION: Grouping and Displaying data to convey meaning – Tables and graphs – Measures of central tendency and dispersion in frequency distributions.

PROBABILITY DISTRIBUTIONS: Types of Probability – Probability rules – Probabilities under conditions of Statistical independence and dependence – Baye’s theorem – Binomial, Poisson, Geometric, Exponential and Normal Distributions.


REFERENCES:
08O003 MATHEMATICAL MODELING

INTRODUCTION TO MODELING: Modeling process, Overview of different kinds of models. (2)

EMPIRICAL MODELING WITH DATA FITTING: Error functions, least squares; fitting data with polynomials and splines. (4)

QUALITATIVE MODELING WITH FUNCTIONS: Modeling species propagation, supply and demand, market equilibrium, market adjustment. Inventory Models- Various types of inventory models with shortage and without shortage, Probabilistic Models. (10)

CAUSAL MODELING FORECASTING: Introduction, Modeling the causal time series, forecasting by regression analysis, prediction by regression. Planning, development and maintenance of linear models, trend analysis, modeling seasonality and trend. (8)

DECISION MAKING: Decisions under uncertainty, under certainty, under risk – Decision trees - Expected value of perfect information and imperfect information. (8)


REFERENCES:

08O004 OPTIMIZATION TECHNIQUES

INTRODUCTION: Statement of an optimization problems – classification of optimization problem – classical optimization techniques; Single variable optimizations, Multi variable optimization, equality constraints, Inequality constraints, No constraints. (3)


DECISION MAKING: Decisions under uncertainty, under certainty and under risk – Decision trees – Expected value of perfect information and imperfect information. (4)

REFERENCES:
08O005  STATISTICAL QUALITY CONTROL  

3 1 0 3.5


THEORY OF ATTRIBUTES: Classes and class frequencies – Consistency of data – Independence of attributes – Association of attributes, Yule’s coefficient of Association – Coefficient of colligation. (5)

ESTIMATION: Point estimation – Characteristics of estimation – Methods of estimation – Interval estimation – Interval estimates of mean, standard deviation, proportion, difference in means and ratios of standard deviation. (6)


STATISTICAL QUALITY CONTROL: Statistical basis for control charts – control limits – control charts for variables – charts for defective – charts for defects. (6)

SAMPLING AND ACCEPTANCE SAMPLING BY ATTRIBUTES: Single sampling plan – Double sampling plan – Multiple sampling plan – Type A and Type B OC curves, consumer’s risk, producer’s risk. ASN, ATI, AOQ curves MIL-STD-105D sampling plans. (5)

CONCEPT OF RELIABILITY, HAZARD RATE AND MEAN TIME TO FAILURE: Mathematical models for reliability studies – Normal, Exponential and Weibull failure laws. System failure rate, system mean time to failure, Series system, Parallel system, (k,n) system, Series-Parallel system. (6)

REFERENCES:

Total 42

08O006  STOCHASTIC MODELS  

3 1 0 3.5


QUEUEING THEORY: Introduction – Characteristics – Steady State Solution: M/M/1, M/M/c, M/M/c/k Models- Queues with unlimited Service – Open Queueing Networks – Closed Queueing Networks – Cyclic Queues – Applications. (10)

REFERENCES:

Total 42
08O016 MICRO MACHINING AND MICRO SENSORS


REFERENCES:

08O017 NANO SCIENCE AND TECHNOLOGY

INTRODUCTION AND CLASSIFICATION: Classification of nanostructures, nanoscale architecture – Effects of the nanometre length scale – Changes to the system total energy, changes to the system structures, vacancies in nanocrystals, dislocations in nanocrystals – Effect of nanoscale dimensions on various properties – Structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems.


INORGANIC SEMICONDUCTOR NANOSTRUCTURES: Quantum confinement in semiconductor nanostructures - Quantum wells, quantum wires, quantum dots, superlattices, band offsets and electronic density of states – Fabrication techniques – Requirements, epitaxial growth, lithography and etching, cleared edge overgrowth – Growth on vicinal substrates, strain-induced dots and wires, electrostatically induced dots and wires, quantum well width fluctuations, thermally annealed quantum wells and self-assembly techniques.


REFERENCES:

080018 INTEGRATED CIRCUIT TECHNOLOGY

INTEGRATED CIRCUITS: Monolithic integrated circuits - origin of silicon and its purification - crystal growth, wafer manufacture, crystal orientation, growth of silicon dioxide, oxidation process, oxide evaluation, thickness, contamination and oxidation reaction.


PHOTOLITHOGRAPHY: Process overview – photosist, process sequence, photomasks, wafer fabrication environment, chemicals and cleaning procedures, chemical monitoring technology personal and clean room procedures.

IC RESISTORS: Sheet resistance, geometrical factors, diffused resistors, tolerance, temperature coefficient, pinch resistors, thin and thick film resistors, IC capacitors, oxide capacitors, junction capacitors, thin and thick film capacitors.

IC TRANSISTORS: NPN transistors, current gain, breakdown voltage, saturation voltage and resistance, leakage currents, noise, frequency response, switching transistors, PNP transistors, diodes, Zener diodes, Schottky barrier diodes, Maximum voltage, current, power and frequency.

REFERENCES:

080019 THIN FILM TECHNOLOGY

EVAPORATION THEORY: Cosine law of emission. Emission from a point source. Mass of material condensing on the substrate.


DEPOSITION MONITORING AND CONTROL: Microbalance, Crystal oscillator thickness monitor, optical monitor, Emission Monitor. Thickness measurement: Multiple Beam Interferometer, Fizeau (Tolansky) technique - Fringes of equal chromatic order (FECO) method - Ellipsometry (qualitative only).


DIELECTRIC PROPERTIES: DC conduction mechanism - Low field and high field conduction. Breakdown mechanism in dielectric films - AC conduction mechanism. Temperature dependence of conductivity.


REFERENCES:

080020 LASER TECHNOLOGY

EMISSION AND ABSORPTION OF RADIATION: Einstein coefficients - negative absorption, shape and width of spectral lines, spontaneous and stimulated emission. (6)

THRESHOLD CONDITION: Rate equations - optical excitation in three and four level lasers, standing waves in a laser, cavity theory, modes, diffraction theory of the Fabry - Perot interferometer. (6)

LASERS WITH SPHERICAL MIRRORS: Types of resonators, stability diagram - coherence - spatial and temporal. (5)

LASER MATERIALS: Activator and host materials for solid lasers - growth techniques for solid laser materials - Bridgman and Stock-Berger technique - Czochralski and Kyropoulous techniques. (5)

TYPES OF LASERS: (A) Gas lasers - He-Ne laser - Ar$^+$, He-Cd$^+$ lasers - N$_2$ and CO$_2$ lasers - Fabrication and excitation mechanisms. (B) Liquid lasers, dye lasers, fabrication and excitation mechanisms. (C) Solid lasers - Ruby, Nd:YAG, glass - semiconductor diode lasers, Excimer Laser, Erbium doped laser. (9)

LASER Q SWITCHING: Mode-locking, second harmonic generation, theory and experiment, materials for optical SHG. (6)

APPLICATIONS: Laser communications, holography, industrial applications: cutting, drilling & welding, medical. Spectroscopic (qualitative), laser Raman effect, stimulated Raman effect - Brillouin scattering. (5)

REFERENCES:

080021 COMPOSITE MATERIALS


REFERENCES:  

080022 ELECTRONIC CERAMICS


OUTLINE OF ELECTRICAL PROPERTIES: Conductivity of ceramic materials – ceramic semiconductors and their uses as fixed resistors, heating elements, thermistors and varistors – piezoelectric ceramics – insulators.  

DIELECTRIC MATERIALS: Electronic, ionic, orientation and space charge polarization mechanisms. Electrical properties such as capacitive loss, dielectric conductivity and dielectric strength. Structural dielectric materials. Ferroelectric theory, ferroelectric state based on local field. Effects of temperature, environment, composition and grain size. Anti-ferroelectric and ferroelectric transition.  

PIEZOELECTRIC CERAMICS: Parameters for piezoelectric ceramics and measurement. General characteristics and fabrication of PZT.  


REFERENCES:  

080023 PLASMA TECHNOLOGY


ARC DISCHARGE: Definition and characteristics - features of arc discharge - types of arcs, high intensity arcs - classification of arcs - free burning arc - wall, vortex, electrode, forced convention and magnetically stabilized arcs - Non thermal arcs; low pressure and low intensity arcs - initiation of arcs - low pressure arc with externally heated cathode - plasma temperature - V-I characteristics - electron and gas temperatures.  

Thermally induced random motion of particles - distribution of temperature and velocity in a gas - ionization of atoms and molecules - Saha equation - degree of ionization - electron concentration - thermodynamic equilibrium of plasma in an electrical discharge - definition of thermodynamic properties of plasma.  

LABORATORY PLASMA SOURCES/DEVICES: Low temperature plasma generation - transferred and non-transferred arc torches and their characteristics - heat transfer efficiency of plasma torches - design accepts - special type of torch for metallurgical applications - vacuum plasma torches - rf torch and their characteristics.

PLASMA DIAGNOSTICS: Electrical probe techniques - spectroscopic methods - charged particle methods - energy balance technique.  

REFERENCES:

080024 COMPUTATIONAL MATERIALS SCIENCE 3 0 0 3

INTRODUCTION: Introduction: Simulation as a tool for materials science, Modelling of Natural phenomena.– Types of models: Quantum mechanical, atomic, mesoscopic, continuum – Multiscale approaches.  


EMPIRICAL METHODS AND COARSE GRAINING: Introduciton - Reduction to classical potentials -- polar systems, Vander Waals potential, potential for covalent bonds, Embedded-atom potential. The Connolly – Williams, approximation – Lattice gas model, Connolly Williams approximation; Potential renormalization. Basic idea; Two step renormalization scheme. The first step, second step and applications to Si.  


QUANTUM MONTE CARLO (QMC) METHODS: Introduction - Variational Monte Carlo methods, Diffusion Monte Carlo method, path integral Monte Carlo method, Quantum spin models and other Quantum Monte Carlo methods.  

REFERENCES:

080025 QUANTUM MECHANICS 3 0 0 3

THE PHYSICAL BASIS OF QUANTUM MECHANICS: Experimental background – the uncertainty principle – wave packets. Schrödinger wave equation, time dependent and time independent equations, interpretation of the wave function and its normalisation, probability current density, expectation values of dynamical variables, operators corresponding to dynamical variables and their postulates – eigen functions and eigen values of operators.  


Total 42
HYDROGEN ATOM: Schrödinger equation for Hydrogen like atoms and its solution (rigorous derivation is not included). Discussions of energy eigen values, the hydrogen orbitals and quantum numbers. (5)

ANGULAR MOMENTUM: Orbital angular momentum, spin angular momentum operators and their properties with eigen values and eigen functions. (5)


VARIATION METHOD: Principles of the variation method for ground state with proof. Application of variation method to He atom. Other simple examples. (4)

TIME DEPENDENT PERTURBATION THEORY: First order correction – interaction between electromagnetic wave and atoms – transition probabilities – Einstein’s coefficients – selection rules for harmonic oscillator and hydrogen atom (rigorous derivation not included). (6)

REFERENCES:

080026 ELECTRO OPTIC MATERIALS 3 0 0 3

BASICS OF LASER: Laser beam characteristics, modes, noise, types of solid lasers (brief). (5)

FUNDAMENTALS OF CRYSTALLOGRAPHY: Symmetry operations and symmetry elements, point groups, tensor properties, dielectric description of a crystal, crystal structure of KDP, BaTiO₃ and LiNbO₃. (6)

PROPAGATION OF ELECTROMAGNETIC WAVES: Anisotropic media - index ellipsoid, propagation in uniaxial crystals, Birefringence, wave plates and compensators, optical activity. (5)

MATERIALS SELECTION FOR ELECTRO-OPTIC AND ACOUSTO-OPTIC DEVICES: Growth of single crystals - Czochralski, Bridgmann and Zone refining techniques. (4)

ELECTRO-OPTIC EFFECT: E-O effect in KDP E-O retardation, E-O modulation - longitudinal and transverse E-O effect in cubic crystals, E-O Q- switching (Experimental) Beam deflectors. (6)

ACOUSTO-OPTIC AND ELASTO-OPTIC EFFECTS: Materials and devices based on these effects - modulators. (4)

NON LINEAR PHENOMENA: SHG, mode locking and frequency mixing - materials and devices. (5)

NON LINEAR OPTICAL MATERIALS AND DEVICES: Semiconductors - measurement of third order optical non-linearities in semiconductors. Optical switching devices employing optical non-linearities in semiconductors. Glasses - origin of non-linearity in glasses - SHG. (5)

MOLECULAR CRYSTALS: Growth of molecular crystals by temperature difference method. Liquid crystal E-O devices (brief). (2)

REFERENCES:

080027 ANALYTICAL METHODS IN MATERIALS SCIENCE 3 0 0 3

X-RAY DIFFRACTION METHODS: Laue method, rotating crystal method, powder method, Debye-Scherrer camera. Intensity of diffracted beams, scattering by an electron; scattering by an atom; scattering by a unit cell - structure factor - Structure factor calculations.


SURFACE STRUCTURE AND SURFACE STRUCTURE ANALYSIS: Unit meshes of five types of surface nets - diffraction from diperiodic structures. Surface methods using electron, low energy electron diffraction (LEED), reflection high energy electron diffraction (RHEED), Scanning Probe microscope.


REFERENCES:

080028 VACUUM SCIENCE AND DEPOSITION TECHNIQUES

ELEMENTS OF HIGH VACUUM SYSTEM: Study of a system to produce high vacuum, pumping speed, conductance of an orifice and tube, losses in pumping speed and determination of pumping speed.

TYPES OF PUMPS: Rotary pump, diffusion pump, ejector pump, turbo molecular pump, roots blower pump, getter ion pump, sputter ion pump, cryosorption pump, cryocondensation pump - working principle, construction, operation - pressure range, limitations and pumping characteristics.

PROBLEMS CONNECTED WITH HIGH VACUUM: Outgassing of materials - real and virtual leaks - methods of leak detection - sealing substance outside and pressure change inside - rate of pressure rise method - halogen leak detector and the helium leak detector.


VACUUM MEASUREMENTS: Primary gauges: Viscosity gauge, radiometer type gauge, Mdeolauau gauge with construction and working principle. Secondary gauges: Pirani gauge, thermocouple gauge, thermionic ionization gauge, cold cathode ionisation gauge (Penning gauge) - working principle, construction and operation limits.

ULTRA HIGH VACUUM GAUGES: X-ray limit of ionisation gauges, Baird Albert gauge, Klopfger gauge, Helmer gauge, Lafferty gauge, Red head gauge.

MATERIALS USED IN VACUUM SYSTEM: Metals and their alloys, elastomer, glasses, ceramics, vacuum greases, oils, cements and waxes, drying and sorption agents.

REFERENCES:
080029 SEMICONDUCTING MATERIALS AND DEVICES

PROPERTIES OF SEMICONDUCTORS: Density of states for a 3 dimensional system and in sub 3 dimensional system – Holes in semiconductors, Band structures of some semiconductors. Modification of band structure by alloying and by hetero structures. Quantum well structures, Intrinsic carrier concentration, Defect levels in semiconductors.


OPTO ELECTRONIC DETECTORS AND LASER DIODES: Optical absorption in a semiconductor, Materials for optical detectors, Photo current in a p-n diode, Solar cell, Avalanche photo detector, Photo transistor, Quantum well inter subband detector. Laser diode, the laser structure, the optical cavity, optical absorption, Loss and gain, Laser below and above threshold. Advanced structures, Double hetero structure laser, Quantum well lasers, Quantum wire and quantum dot lasers.

REFERENCES:

080030 SENSORS FOR ENGINEERING APPLICATIONS

STRAIN AND PRESSURE MEASUREMENT: Resistance strain gauge, piezoelectric pressure gauge, characteristics. Electronic circuits for strain gauge, load cells. Interferometer, Fibre-optic methods. Pressure gauges Anodir capacitance pressure gauge, ionization gauge, Using the transducers for applications.

MOTION SENSORS: Capacitor plate sensor, Inductive sensors, LVDT Accelerometer systems, rotation sensors drag cup devices, piezoelectric devices. Rotary encoders.

LIGHT RADIATION: Color temperature, light flux, photo sensors, photomultiplier, photo resistor and photoconductors, photodiodes, phototransistors, photovoltaic devices, fiber-optic applications, light transducer, solid-state transducers liquid crystal devices.

HEAT AND TEMPERATURE: Bimetallic strip, Bourdon temperature gauge, thermocouples, Resistance thermometers, thermistors, PTC thermistors, bolometer, Pyroelectric detector.

ELECTRONIC SENSORS: Proximity detectors – Inductive and capacitive, ultrasonic, photo beam detectors Reed switch, magnet and Hall-effect units, Doppler detectors, liquid level detectors, flow sensors, smoke sensors.

REFERENCES:

Total 42
CHEMISTRY

080031 ENERGY STORING DEVICES AND FUEL CELLS

BATTERY CHARACTERISTICS: Voltage, current, capacity, electricity storage density, power, discharge rate, cycle life, energy efficiency, shelf life.

PRIMARY BATTERIES: The chemistry, fabrication, performance aspects, packing and rating of zinc-carbon, magnesium, alkaline, manganese dioxide, mercuric oxide, silver oxide batteries, zinc/air and lithium button cells- solid electrolyte cells.

SECONDARY BATTERIES: The chemistry, fabrication and performance aspects and rating of lead acid and valve regulated (sealed) lead acid, nickel-cadmium, nickel-zinc, lithium and lithium ion batteries - Rechargeable zinc alkaline battery. Reserve batteries. Zinc/silver oxide, lithium anode cell, thermal batteries.

BATTERIES FOR ELECTRIC VEHICLES: Metal/air, zinc-bromine, sodium-beta alumina and lithium/iron sulphide batteries (outline only). Photogalvanic cells. Battery specifications for cars, heart pacemakers, computer standby supplies etc.


TYPES OF FUEL CELLS: Description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells. Proton Exchange Membrane fuel cells - basic aspects – working and high temperature operation – recent development in technology.

HYDROGEN AS FUEL: Sources of hydrogen and preparation – clean up and storage – use as fuel in cells.


TEXT BOOKS:

REFERENCES:

080032 POLYMERS IN ELECTRONICS


TEXT BOOKS:

REFERENCES:

080033 ORGANIC ELECTRONICS


TEXT BOOK:

080034 FUNCTIONAL COATINGS BY POLYMER MICRO ENCAPSULATION

SUITABILITY OF TEXTILES: Textile reactive sites – cellulose, protein, amide, acrylonitrile, ester, urethane, Linkages – ionic, covalent, co-ordinate, vander Waals’ – Absorption and adsorption – Glass transition temperature and properties. (9)

CHEMICALS AND POLYMERS FOR DEPOSITS: Titanium oxide, zinc oxide, carbon black, barium sulphate – polyamine, polystyrene, polyalcohol, polyester, polyurethane – eco parameters, surface tension and surface active compounds. (8)

APPLICATION METHODS: Selection of methods for suitable fabric – deposition and reaction type – resin finishing, silicone finishing, emulsion finishing, enzyme finishing – mechanism of durable finishing – heat setting, chemical and electrochemical theory – colloidal theory, solid solution theory. (9)

EFFECT OF TECHNIQUES: Finishing effect – UV protection, stain repellent, anti static, flame retardant, water repellent/water proof, anti microbial. (8)

QUALITY ASSESSMENT: Assessment for durability, strength, softness, stiffness – hydrophilic and hydrophobic character – Suitable testing methods. (8)

TEXT BOOKS:

REFERENCES:

47
08O035 ANALYTICAL METHODS FOR TEXTILES AND TEXTILE ANCILLARIES

MOLECULAR WEIGHT DETERMINATION: Number Average, Weight Average, Viscosity average molecular weights. Methods of determination of molecular weight for original and suitably chemical treated textiles. (8)

QUALITATIVE ANALYSIS: Identification of textile polymers – confirmation of different groups in the textile polymers – cellulose, protein, amide, ester – methods of analysis, Fastness characters of different dyes – Investigation of dyes. (6)


MICROSCOPIC, AND X-RAY STUDY: Projection microscopes, Scanning Electron Microscope, X-ray diffraction- Assessment of alignment, morphology, phases and differences that arise during treatments. (8)

SPECTROSCOPIC STUDIES: UV-VIS, FTIR and NMR spectroscopic studies. (8)

QUALITY STUDY: Efficiency of achievement in quality using various suitable chemical treatments – scouring, mercerising, dyeing, printing and finishing, cleaning by wet and solvent methods – Stain removal. (6)

TEXT BOOKS:

REFERENCES:

08O036 POLYMERS AND COMPOSITES


REINFORCEMENTS AND REINFORCEMENT–MATRIX INTERFACE: Natural, synthetic organic and inorganic fibres. – particulate and whisker reinforcements – reinforcement matrix interface. Production, chemistry and properties of glass fibre, asbestos, boron, high silica and quartz fibers. (6)

MATRIX MATERIALS: Manufacturing, chemistry, properties, curing and suitable reinforcing materials for polyester resins, epoxy resins, phenolic and silicones. High temperature resistant polymers. (5)

PROCESSING METHODS: Hand lay-up techniques: Simple and complex, spray-up, wet lay-up low compression molding, moldless lay-ups. Structural laminate bag molding, reinforced molding compounds, prepregs, filament winding. (6)

TESTING OF COMPOSITES: Tension, flexure, interlaminar shear, compression with sandwich beam tests. (3)

NON-DESTRUCTIVE TESTS: Ultrasonic inspection, radiography, vibration and thermal methods, acoustic emission. (3)

POLYMER NANOCOMPOSITES: Classification, nanosized additives, advantages. Clay containing polymeric nanocomposites, polyolefine nanocomposites, polymer silicate nanocomposite via melt – Applications of nanocomposites. (6)

APPLICATION OF POLYMER COMPOSITES: Polymer-matrix composites with continuous and discontinuous fillers application in electrical, electromagnetic, thermoelectric, dielectric, optical applications. Polymer composite for biomedical and vibration damping. (8)

TEXT BOOKS:

REFERENCES:
080037 CORROSION SCIENCE AND ENGINEERING

THERMODYNAMICS OF AQUEOUS CORROSION: Electrode processes – electrode potential, free energy, emf series, potential measurements, computation and construction of Pourbaix diagrams of Fe, Al, practical use of E-pH diagrams. Chemical Vs electrochemical mechanisms of corrosion reactions, corrosion rate expressions. (7)

KINETICS OF AQUEOUS CORROSION: Corrosion current density and corrosion rate, exchange current density, polarization - activation control, Tafel equation, concentration polarisation, mixed potential theory, combined polarization. Passivity-potentiostatic polarization curves, factors affecting passivity, mechanism of action of passivators. (7)


CORROSION TESTING: Purpose and classification. Dimensional charge - Ultrasonic thickness measurements, eddy current, microscopic examination. Weight charge – Specimen preparation, test conditions and evaluation of results for overall corrosion, SCC, IGC. Electrochemical techniques – Polarization curves, Tafel extrapolation, linear polarization, AC impedance methods (EIS). (4)

TEXT BOOKS:

REFERENCES:

080038 CHEMISTRY OF NANOMATERIALS


NLO PROPERTIES OF ORGANIC MATERIALS: Basic concepts-Relationship between molecular structure and NLO properties - Materials design-organic crystals-Polymers, self assembled monolayer-Third order NLO materials – Chromophores for optical limiting. (8)


NANOCATALYSIS: Introduction – Chemical Reaction on point Defects of Oxide surfaces – Chemical Reactions and catalytic Processes on free and supported clusters. (8)


magnetic behavior – Binding energies and melting points – optical and electronic properties – NLO properties – metals and semiconductors.

TEXT BOOK:

REFERENCE:

080039 POLYMER CHEMISTRY AND POLYMER PROCESSING


COMPRESSION AND TRANSFER MOLDING PROCESS: Principle, thermosetting compounds, compression molding and transfer moulding, reaction injection molding cold forming, sintering and ram extrusion.

CASTING AND FOAMING PROCESS: Casting process – equipment, product considerations, operation and control. Foaming process: Process to create foams in resins, processes to shape and solidify foams, foam insulation.

FIBER REINFORCED PLASTICS: Materials, hand lay-up process, sheet moulding compound (SMC), dough moulding compound, process variants, mechanical strength of fiber reinforce plastics.

TEXT BOOKS:

REFERENCES:

080040 ELECTROANALYTICAL METHODS

FUNDAMENTAL CONCEPTS: Electroanalysis, faradaic processes, mass-transport-controlled reactions, potential-step experiment, potential-sweep experiments, rate of electron transfer, activated complex theory, electrical double layer, electrocapillary effect.


CONTROLLED-POTENTIAL TECHNIQUES: Chronoamperometry, polarography, pulse voltammetry, normal-pulse voltammetry, differential-pulse voltammetry, square-wave voltammetry, staircase voltammetry, ac voltammetry. Stripping analysis.


POTENCIOMETRY: Principles of potentiometric measurements, Ion-selective electrodes - glass electrodes, pH electrodes, glass electrodes, liquid membrane electrodes, ion exchanger electrodes, neutral carrier electrodes and solid-state electrodes.

Total 42
080041 INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS 3003


THERMAL METHODS OF ANALYSIS: Thermal analytical techniques – TGA, DTA, DSC – principles, instrumentation and applications.


TEXT BOOKS:

REFERENCES:

080042 ADVANCED REACTION MECHANISM 3003

ADDITION REACTIONS: Reactive intermediates – formation and stability of carbonium ions, carbanions, carbenes and carbenoids, nitrenes, radicals and arynes. Addition to carbon-carbon and carbon – hetero multiple bonds –electrophilic, nucleophilic and free radical additions - stereochemistry of addition to carbon-carbon multiple bonds- orientation and reactivity, addition to conjugated systems and orientation – addition to \( \alpha,\beta \) unsaturated carbonyl groups.

SUBSTITUTION REACTIONS: Aliphatic nucleophilic substitutions – SN1, SN2 and SNi mechanisms- effects of substrate, attacking nucleophile, leaving group and solvent- stereochemistry of nucleophilic substitution reactions- substitutions at carbonyl, bridgehead, vinylic and allylic carbons- neighbouring group participation, norbornyl cation and other non-classical carbocations, ambident nucleophiles – O versus C alkylation, aromatic nucleophilic substitutions - mechanisms effects of substrate, structure, leaving group and attacking nucleophile. – various methods of benzyne generation and reactions of benzenes, reactions of ary diazonium salts. Vicarious nucleophilic substitution (VNS), Chichibabin and Schiernman reactions - Aromatic electrophilic substitution reactions and mechanisms.


REAGENTS IN ORGANIC SYNTHESIS: Diborane, lithium aluminium hydride, sodium borohydride, selenium dioxide, osmium tetroxide, phenyl isothiocyanate, NBS, dicyclohexylcarbodiimide(DCC), lead tetraacetate, pyridinium chlorochromate(PCC), Swern oxidation, p-toluenesulphonyl chloride, trifluoroacetic acid, lithium disopropylamide (LDA), 1,3-dithiane (reactive umpolung), crown ethers, trimethyl silyl iodide, dichlorodicyanobenzoquinone (DDQ), Gilman’s reagent, lithium dimethyloxalate, tri-n-butyltin hydride, di-tet-butoxy dicarbonate, dihydropyran, phase transfer catalysts, Wilkinson’s catalysts, Peterson’s synthesis, Merrifield resin and diethylaluminum cyanide. (8)

TEXT BOOKS:

REFERENCES:

080043 CHEMICAL SENSORS AND BIOSENSORS


DETERMINATION OF METAL IONS BY FLUORESCENCE ANISOTROPY: Theory of anisotropy based determination of metal ions – fluorescent aryl sulfonamides for zinc determination- removal of zinc from carbonic anhydrase – determination of zinc using reagent approach – determination of copper and other ions by using reagentless approach. (7)

REFERENCES:

080044 COMPUTATIONAL PHYSICAL CHEMISTRY


COMPUTER APPLICATIONS: Coordinate specification – Z-matrix – Cartesian coordinates – Introduction to structure drawing – Hands on use of software packages – Gaussian; Gamess, Molden.

TEXT BOOKS:

REFERENCES:

080045 MOLECULAR SPECTROSCOPY


ELECTRON SPIN RESONANCE SPECTROSCOPY: Principle – factors affecting the intensity – hyperfine splitting – g values and their significance – application to simple systems.

TEXT BOOKS:
REFERENCES

HUMANITIES

08O046 PRINCIPLES OF MANAGEMENT 3 0 0 3

PRINCIPLES OF MANAGEMENT: Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Engineers and Organizational Environment – Social, Economic, Technological and Political. Social Responsibility of Engineers. (5)

MANAGEMENT CONCEPTS: MBO, Theory Z, Kaizen, Six Sigma, Quality Circles and TQM. (5)

BUSINESS PROCESS REENGINEERING: Need for BPR, Various phases of BPR, Production and Productivity – Factors Influencing Productivity. (4)

ORGANIZATIONAL BEHAVIOUR: Significance of OB, Role of leadership, Personality and Motivation. Attitudes, Values and Perceptions at work. (5)

INDUSTRIAL AND BUSINESS ORGANIZATION: Growth of Industries (Small Scale, Medium Scale and Large Scale Industries). Forms of Business Organizations. Resource Management – Internal and External Sources. (5)

MATERIALS MANAGEMENT: Importance and Scope of Materials Management, Purchase Procedure, Inventory Control and Systems for Inventory Control – ROL, EOQ, MRP, ABC Analysis, VED, FSN and Value Analysis. (4)


HUMAN RESOURCE MANAGEMENT: Importance, Objectives and Functions, Job Analysis and Recruitment, Selection and Placement, Training and Development – Case Discussion. (4)


WELFARE IN INDUSTRY: Working condition, service facilities, legal legislation – Factories Act, 1948 and Workmen’s Compensation Act. (3)

Total 42

TEXT BOOKS:

REFERENCES:

08O047 HUMAN RESOURCE MANAGEMENT 3 0 0 3

NATURE AND SCOPE OF HUMAN RESOURCE MANAGEMENT: Meaning and Definition of HRM, Objectives and Functions of HRM, Models of HRM, HRM in a changing Environment, Role of Globalization in Human Resource Management. (4)


WAGE AND SALARY ADMINISTRATION: Principles and Techniques of Wage Fixation, Job Evaluation, Incentive Schemes. (4)

TRAINING AND DEVELOPMENT: Principles of Learning, Objectives, Types and Training Methods, Management Development: Its Meaning, Scope and Objectives.


WORK ENVIRONMENT AND TERMS AND CONDITIONS OF EMPLOYMENT: Fatigue – Safety – Accident Prevention Accident Records – Industrial Relations.

INTERNATIONAL HRM: Model, Variables that outline difference between local and International HRM approaches to IHRM, Linking HRM to International Expansion Strategies.


TEXT BOOK:

REFERENCES:

080048 INTRODUCTION TO MANAGEMENT 3 0 0 3


TEXT BOOK:
REFERENCES:

08O049 ORGANISATIONAL BEHAVIOUR

3 0 0 3

MEANING & IMPORTANCE OF OB: Historical Development & Contributing Disciplines. (2)

PERSONALITY AND EMOTIONS: Its Determinants & Attributes – Values & Attitudes – Components and Functions of Attitudes – Emotional Intelligence. (3)

MOTIVATION: Basic Concepts, Motivation Theories, Problems in Motivation. (2)

VALUES: Attitudes and Job Satisfaction. (2)

GROUP DYNAMICS: Types of Groups, Group Norms and Cohesiveness: Group Roles. (2)

COMMUNICATION: Functions – Fundamentals and Current Issues. (3)

TEAM BASED ORGANIZATION: Need for Teams – Team Building – Effectiveness of Teams. (3)

ORGANIZATIONAL CULTURE: Element, Culture and Performance Merging Organizational, Cultures, Changing and Strengthening Culture. (3)

CONFLICTS AND NEGOTIATION. (3)

LEADERSHIP: Theories of Leadership, Leadership Styles and Effectiveness. (4)

EMPLOYMENT RELATIONSHIP AND CAREER DYNAMICS: The Psychological Contract – Socialization – Organizational Careers – Contingent Workforce. (4)

ORGANIZATIONAL CHANGE: Forces for Change Force - Resistance to change Field - Analysis Model – Organization Development. (4)

WORK STRESS: Causes and Consequences – Stress coping Strategies. (4)

CASES (3)

Total 42

TEXT BOOK:

REFERENCES:

08O050 VALUE MANAGEMENT

3 0 0 3


VALUE BASED MANAGEMENT : Creating Shareholder Value. (3)

MINTZBERG’S MANAGEMENT ROLES. (1)

PLANNING: The meaning and purpose of planning – Steps in Planning –Types of Plans. (4)

MANAGEMENT BY OBJECTIVES. (2)

POLICIES, PROCEDURES AND METHODS: Nature and type of policies – functional policies. (2)

DECISION MAKING PROCESS AND FUNDAMENTALS: Types of decisions. (2)

ORGANIZING: Meaning and structure – Authority and span of control, Delegation and decentralization – Line and Staff relationship. (4)
STAFFING: Sources of recruitment – Selection Process. (3)

COORDINATION: Steps to promote coordination. (1)

DIRECTING: Nature of directing – Leadership, motivation and communication. (3)

CONTROLLING IN MANAGEMENT: Control Process. (5)

CHANGE MANAGEMENT: Organizational Change, Perspectives on Organizational Change. (4)

INNOVATION MANAGEMENT. (4)

TOTAL 42

TEXT BOOK:

REFERENCES:
08O052 MICRO ECONOMIC ENVIRONMENT

INTRODUCTION TO MICRO ECONOMICS: Basic problems of an Economy – Business Decisions. (5)

MARKET MECHANISM: Price determination by demand and supply forces – Taxes and Subsidies. (6)

ELASTICITIES OF DEMAND AND SUPPLY: Applications. (4)

THEORY OF CONSUMER BEHAVIOUR: Consumer Surplus – Applications. (4)

THEORY OF PRODUCTION AND COSTS: Short run and long run – Economies of Scale. (4)

MARKET STRUCTURE: Perfect competition, monopoly, oligopoly and monopolistic competition. (6)

INTRODUCTION TO GAME THEORY. (5)

EXTERNALITIES AND PUBLIC GROWTH. (4)

UNCERTAINTY AND RISK. (4)

Total 42

TEXT BOOK:

REFERENCES:

08O053 MARKETING SYSTEMS


INDUSTRY ANALYSIS AND COMPETITIVE ADVANTAGE: Defining Markets and Industry – Industry Analysis Porter’s Five Competitive Forces. (3)

CONSUMER MARKETS AND BUYING BEHAVIOUR: Buying Population – Buying Decision – Buying Participants – Buying Influences – Buying Process – Case Analysis. (4)


THE MARKETING INFORMATION SYSTEMS: The Concept of Market – Information System. (3)


PRODUCTMIX STRATEGIES: Branding Strategies – Sustaining Competitive Advantage over the Product Life Cycle. (3)


MARKETING CHANNEL AND PHYSICAL DISTRIBUTION: Channel Design – Channel Management – Channel Modification – Retailing – Wholesaling. (3)

INTRODUCTION TO ADVERTISING, SALES PROMOTION AND PUBLIC RELATIONS: Publicity and Personal Selling. (3)

DEVELOPING AND MANAGING AN ADVERTISING PROGRAM: Effectiveness of Advertising. (3)


Total 42

TEXT BOOK:
REFERENCES:

08O054 ENTREPRENEURSHIP

3 0 0 3

INTRODUCTION TO ENTREPRENEURSHIP: Definition – Characteristics and Functions of an Entrepreneur – Common myths about entrepreneurs – Importance of Entrepreneurship.


DEVELOPING AN EFFECTIVE BUSINESS MODEL: The Importance of a Business Model – Components of an Effective Business Model – Developing and Writing the Business Plan.

APPRAISAL OF PROJECTS: Importance of Evaluating various options – Appraisal Techniques.


TEXT BOOK:

REFERENCES:

08O055 ANALYSIS OF MANUFACTURING AND SERVICE SYSTEMS

3 0 0 3


JOB PRODUCTION: Mass Production – Batch Production – Continuous Processing – Special Projects – Make or Buy Decisions.


MATERIALS MANAGEMENT: Aggregate Production Planning – Gantt Charts – Sequencing and Scheduling.


TEXT BOOK:

REFERENCES:

080056 FINANCIAL AND MANAGEMENT ACCOUNTING


RECEIVABLES MANAGEMENT, INVENTORY MANAGEMENT AND CASH MANAGEMENT: Basic Concepts Only.

TEXT BOOK:

REFERENCES:
08O057 MANAGERIAL FINANCE


SENSITIVITY ANALYSIS OF RISKY PROJECTS: Monte Carlo Simulation Analysis – Decision Trees.


TEXT BOOK:

REFERENCES:

08O058 WORKING CAPITAL MANAGEMENT


INVENTORY MANAGEMENT: Inventory – Generality of Inventory Analysis – The EOQ Model – Extending the EOQ Model.


THE PAYMENTS PATTERN APPROACH: Corporate Practice – Payments Pattern Approach.


TEXT BOOK:

REFERENCES:

COST CONCEPTS IN DECISION MAKING.

VARIABLE (MARGINAL) COSTING: Concepts of Absorption and Variable Costing.

COST-VOLUME-PROFIT (CVP) RELATIONSHIP: Techniques of CVP Analysis.

DECISION-MAKING PROBLEMS: Decision-making – types of decision-making problems.


BUDGETING: Concept of Budgeting – Concept of Budgetary Control – Objectives and Functions of Budgeting.


INVENTORY MANAGEMENT: Meaning – Inventory Systems.

QUAMTITATIVE TECHNIQUES FOR DECISION MAKING AND COST MANAGEMENT: LP – PERT – CPM.

TEXT BOOK:

REFERENCES:

TECHNOLOGY INCUBATORS AND COMMERCIALISATION OF INNOVATION


TECHNOLOGY BUSINESS INCUBATOR: Benefits of TBI – Agencies Involved – Global Scenario of TBI – Indicators of Success for TBI.


GLOBALIZING CHANGE: Joint Production versus – Co-Production – Global New Product Launch.

TEXT BOOK:

REFERENCES:
LEARNING ENGLISH THROUGH LITERATURE: Literary texts drawn from English and American Literature, and Indian writing in English to be used

- Short Stories (6)
- One Act play (4)
- Poetry (6)
- Literary Essay (6)

PROFESSIONAL AND SOFT SKILLS TRAINING IN ENGLISH:

- Intra & Interpersonal Communication (2)
- Interview Techniques (2)
- Group Communication (5)
- Etiquette – Body Language, Telephone Conversation etc. (2)
- Professional report writing (3)
- Mass Communication – email writing / public speaking/ presentation techniques/ preparing Advertisements (6)

TEXT BOOK:
1. Teaching Material prepared by the Faculty, Department of English

REFERENCES:

INTRODUCTION: Alphabets, Greetings, Vocabulary, Grammar – Pronouns, Verbs and their conjugations, Articles, Question words, Statements and questions, Negation, Countries, Nationalities and Languages. Simple dialogues, Exercises. (10)

POSSESSIVE PRONOUNS: Family, Professions, the verb ‘sein’, Number system, Nouns – singular and plural. Imperative statements. A small text and dialogues related to family. Exercises. (7)


Time and time related particles. Daily routines, related verbs and question words. Related vocabulary and grammar. Sample dialogues and exercises. (8)

Separable and inseparable verbs and their related usage pattern. Invitations and telephone conversations. Exercises.

(FINAL EXAM – Hearing, Oral and Written) (3)

TEXT BOOK:
1. To be modeled by the Faculty.

REFERENCES:
080063 BASIC FRENCH

INTRODUCTION

DOSSIER O: Rencontres, présentations, nationalités - saluer, vous excuser, vous présenter - demander et donner votre identité - computer et peeler des mots - les verbes être, avoir et s’appeler, au présent (singulier) - des noms et des adjectifs au singulier - C'est + nom ou pronom - / est + adjectif - La négation ne... pas - Des phrases interrogatives.

DOSSIER 1: l’arrivée en France - une inscription (à un club de cyclotourisme) - ce qu’on dit en classe (consignes) - Vous informer sur l'identité d'une personne - distinguer les formes - familières et les formes de politesse - des articles et des adjectifs possessifs, au singulier - des mots interrogatifs: quell (adjective), qui (pronoun) ou, comment (adverbes) - des noms de professions.

DOSSIER 2: la famille - quelques personages célèbres - présenter votre famille et des amis - dire ou sont les gens et d’ou ils viennent - les verbes en-er, être, avoir et venir au présent - le plural des noms, des adjectifs, des articles et des adjectifs possessifs - la négation ne... pas de + nom - l’interrogation avec est - ce que - a. an et de + noms de villes et de pays.

DOSSIER 3: maisons et appartements - déménagements, locations, petites annonces - monuments parisiens - situer des meubles et des objets (la localisation) - indiquer la possession - donner des ordres et des interdictions - exprimer l’accord et le refus-les verbes en-er, faire, prendre et nettoyer, au présent et à l’imperative - le pronom on - les pronoms toniques après préposition - les adjectifs demonstratifs - les adjectifs ordinaires - la réponse si - il ya ... un/des.

REFERENCE:

080064 BASIC CONVERSATIONAL SKILLS IN JAPANESE LANGUAGE

ORIENTATION: Geographic and socio-economic perspective of Japan, people and culture, basic greetings. Basic scripts – Hiragana and Katakana, sounds and combinations. Basic particles and introductions to demonstratives, place markers and direction markers.

TIME RELATED WORDS: Time of day, days of the week, months and dates of a month. Asking for and telling the time. Verb tenses – Present/future and past. Destination markers, direct object particle and other particles related to mode of transportation and place of action.

ADJECTIVES: Introduction to adjectives, types and negative forms, different usages, comparisons, likes and dislikes. Verbs denoting presence and related particles. Counters and counting suffixes. Sentences involving need and desire, wanting to perform an action and movement for a certain purpose.

VERBS: Groups (I, II and III) and exercises in group verbs. Describing a natural phenomenon, habitual action and a continuing state. Sentences involving asking for and granting permission.

ROLE PLAYS IN JAPANESE: Demonstration on usage of chopsticks – Japanese tea party.

REFERENCE:
1. Minna no Nihongo I Honsatsu Roma-ji ban (Main Textbook Romanized version)

DEPARTMENT ELECTIVES

08E001 COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES


OPTIMUM DESIGN: Selection of objective function, variables and constraints - Effects of variables on objective function and performance - Non-linear programming approach.
08E002 PLC AND DISTRIBUTED CONTROL SYSTEM


PROGRAMMING OF PLC: Types of Programming - Simple process control programs using Relay Ladder Logic and Boolean logic methods - PLC arithmetic functions - Introduction to advanced programming methods.

HMI SYSTEMS: Necessity and Role in Industrial Automation, Text display - operator panels - Touch panels - Panel PCs - Integrated displays (PLC & HMI)


APPLICATIONS OF PLC & DCS: Case studies of Machine automation, Process automation, Introduction to SCADA Comparison between SCADA and DCS

TEXT BOOKS:

08E003 HIGH VOLTAGE ENGINEERING

IONIZATION AND DECAY PROCESS: Introduction- Ionization process- Types of ionization - Electron collision - Photo ionization - Thermal ionization - Electron detachment and recombination - Mobility of gaseous ions and Decay by diffusion - Cathode process.

ELECTRIC BREAKDOWN IN GASES: Properties of insulating gases - Townsend's criterion for break down - Mechanism of spark - Breakdown voltage characteristics in uniform and non uniform fields - Penning effect - Time lag for breakdown - Corona discharges - Paschen's law.

ELECTRIC BREAKDOWN IN SOLIDS: Intrinsic breakdown - Electromechanical breakdown - Stream breakdown - Thermal breakdown - Erosion breakdown - Breakdown of composite insulation - Solid dielectrics used in practice.
ELECTRIC BREAKDOWN IN LIQUIDS: Electronic breakdown - Cavitation breakdown - Suspended particle mechanism - Conduction and breakdown in pure and commercial liquids.


NON DESTRUCTIVE TESTING OF MATERIALS AND ELECTRICAL APPARATUS: Measurement of resistivity - High voltage dielectric loss measurement - Schering bridge - Measurement of large capacitance - Inductively coupled ratio - Arm bridge - Loss measurement on complete equipment - Discharge measurement - Recurrent surge generator.


REFERENCES:

REFERENCES:

**08E004 HVDC TRANSMISSION**

3 0 0 3


ANALYSIS OF THE BRIDGE CONVERTER: Analysis with gate control but no overlaps – With overlap less than 60 degrees - With overlap greater than 60 degrees - Complete characteristics of rectifier – operation of Inverter.

CONTROL: Basic means of control – Gate control – Power reversal – constant current versus constant voltage – control characteristics – Stability of control – Frequency control – Multi terminal lines.

MISOPERATION OF CONVERTERS: Converter disturbance – By pass action in bridges – Short circuit on a rectifier – Commutation failure.


REFERENCES:
08E005 SPECIAL MACHINES AND CONTROLLERS


REFERENCES:

08E006 ADVANCED CONTROL SYSTEMS


STATE SPACE ANALYSIS: State space representations – State Transition Matrix – Solution of State equations-Controllability and Observability – Pole placement by state feedback.

SAMPLED DATA SYSTEM: Sampling process – Sample and hold - Reconstruction of sampled signals - Hold circuits zero and first order hold - Z and Inverse Z transform - Pulse transfer function - Step response.


REFERENCES :

08E007 VIRTUAL INSTRUMENTATION SYSTEMS

INTRODUCTION: General functional description of a digital instrument - Block diagram of a Virtual Instrument - Physical quantities and Analog interfaces - Hardware and Software - User interfaces - Advantages of Virtual instruments over conventional instruments - Architecture of a Virtual instrument and its relation to the operating system.

SOFTWARE OVERVIEW: LabVIEW - Graphical user interfaces - Controls and Indicators - 'G' programming - Labels and Text - Shape, Size and Color - Owned and free labels - Data type, Format, Precision and representation - Data types - Data flow programming - Editing - Debugging and Running a Virtual instrument - Graphical programming palettes and tools - Front panel objects - Functions and Libraries.
PROGRAMMING STRUCTURE: FOR loops, WHILE loops, CASE structure, formula nodes, Sequence structures - Arrays and Clusters - Array operations - Bundle - Bundle/Unbundle by name, graphs and charts - String and file I/O - High level and Low level file I/O's - Attribute modes Local and Global variables.


HARDWARE ASPECTS: Installing hardware, Installing drivers - Configuring the hardware - Addressing the hardware in LabVIEW - Digital and Analog I/O function - Data Acquisition - Buffered I/O - Real time Data Acquisition.

LABVIEW APPLICATIONS: IMAQ - Motion Control; General Applications - Feedback devices, Motor Drives - Instrument Connectivity - GPIB, Serial Communication - General, GPIB Hardware & Software specifications - PXI / PC1: Controller and Chassis Configuration and Installation.

TEXT BOOKS:

REFERENCES:

08E008 NEURAL NETWORKS AND FUZZY SYSTEMS 3 0 0 3

INTRODUCTION TO NEURAL NETWORKS: Differences between Biological and Artificial Neural Networks - Typical Architecture, Common Activation Functions, McCulloch - Pitts Neuron, Simple Neural Nets for Pattern Classification, Linear Separability - Hebb Net, Perceptron, Adaline, Madaline - Architecture, algorithm, and Simple Applications.


NEURAL NETWORKS BASED ON COMPETITION: Kohonen Self Organising Maps, Learning Vector Quantization, Counter Propagation - Architecture, Algorithm and Applications.


MEMBERSHIP FUNCTIONS: Features of membership function, Standard forms and Boundaries, fuzzification, membership value assignments, Fuzzy to Crisp Conversions, Lambda Cuts for fuzzy sets and relations, Defuzzification methods.


TEXT BOOKS:

REFERENCES:
08E009  VLSI DESIGN

OVERVIEW OF VLSI DESIGN METHODOLOGY: VLSI design process - Architectural design - Logical design - Physical design - Layout styles - Full custom - Semi custom approaches.

BASIC ELECTRICAL PROPERTIES OF MOS AND CMOS CIRCUITS: MOS Transistor – Threshold voltage - Pass transistor - Transmission gate - Basic DC equations - Second order effects - MOS modules - Small signal AC characteristics - nMOS inverter - Steered input to an nMOS inverter - Depletion mode and enhancement mode pull ups - CMOS inverter - DC characteristics - Inverter delay – Power consumption in CMOS gates – Static dissipation – Dynamic Dissipation.

VLSI FABRICATION TECHNIQUES: An overview of wafer fabrication - Wafer processing - Oxidation - Patterning - Diffusion - Ion implantation - Deposition - Silicon gate nMOS process – CMOS processes – n well - p well - Twintub - Silicon on insulator - CMOS process enhancements - Interconnect - Circuit elements - latchup - Latch up prevention techniques.

MOS AND CMOS CIRCUIT DESIGN PROCESSES: Layer representations - Stick diagrams - nMOS design style - CMOS design style - Design rules - Need for design rules - Mead Conway design rules for the silicon gate nMOS process - CMOS n well / p well lambda based design rules - Simple layout examples.

Sheet resistance - Resistance estimation - Capacitance estimation - Driving large capacitive loads.

nMOS AND CMOS CIRCUIT AND LOGIC DESIGN: Switch logic- Pass transistor and transmission gate - Gate logic - Other forms of CMOS logic - Dynamic CMOS logic - Clocked CMOS logic - Precharged domino CMOS logic - Structured design - Simple combinational logic design examples - Parity generator - Multiplexers - Clocked sequential circuits - Two phase clocking - Charge storage - Dynamic register element - nMOS and CMOS - Dynamic shift register - Semistatic register - JK flip flop


TOTAL 42

TEXT BOOKS:

REFERENCES:

08E010  ANALOG VLSI DESIGN

DEVICE MODELLING: Introduction to Analog Design-MOS device model-DC, small signal and large signal model. Diode model- DC, small signal and high frequency model.BJT: DC small signal and high frequency model. Passive components in MOS technology.


OPERATIONAL AMPLIFIER: Bipolar Operational Amplifier, Design Considerations, Basic Two stage MOS Opamp-Output stages Frequency response and Frequency Compensation,Comparators- characteristics and two stage comparators.

SWITCHED CAPACITOR CIRCUITS: General Considerations, Sampling Switches, Switched Capacitor Amplifier, Switched Capacitor Integrator.

D/A AND A/D CONVERTERS: Data Converter fundamentals,DAC and ADC specifications, Charge scaling DAC’s, Pipeline DAC’s-Pipeline ADC and Oversampling ADC.

TOTAL 42

TEXT BOOKS:

REFERENCES:

08E011 MIXED SIGNAL VLSI DESIGN


INTRODUCTION TO ACTIVE FILTERS and SWITCHED CAPACITOR FILTERS: Active RC filters for monolithic filter design – First and Second order filter realizations - Universal active filter (KHN) – Self tuned filter – Programmable filters – Switched capacitor filters: Switched capacitor resistors – amplifiers – comparators – sample and hold circuits – Integrator – Biquad. (9)


DIGITAL TO ANALOG and ANALOG TO DIGITAL CONVERTERS: Non-idealities in the DAC – Types of DAC’s – Current switched, Resistive, Charge redistribution (capacitive), Hybrid, segmented DAC’s – Techniques for improving linearity – Analog to Digital Converters: quantization errors – non-idealities – types of ADC’s: Flash, two step, pipelined, successive approximation, folding ADC’s. (9)

SIGMA DELTA CONVERTERS: Over sampled converters – Over sampling with out noise and with noise – Implementation imperfections – First order modulator – Decimation filters – Second order modulator – Sigma delta DAC and ADC’s. (5)

MIXED LAYOUT: CMOS design rules – Layout of CMOS – BJT – Capacitors – Resistors – Mixed layout issues: Floor planning, power supply and ground, fully differential matching, Guard rings and shielding. (4)

TEXT BOOKS:

REFERENCES:

08E012 BIOMEDICAL INSTRUMENTATION

BASIC PHYSIOLOGY: Cells and their structures - Transport of ions through cell membrane - Resting and excited state transmembrane potential - Action potential - Propagation of Bioelectric potential - Nervous system - Physiology of muscles - Heart and Blood circulation - Respiratory system - Urinary system. (5)

ELECTRODES AND TRANSDUCERS: Basic electrode theory - Micro electrodes - Skin surface electrodes - Needle electrodes - Equivalent circuit - Electrode materials - Chemical electrodes - Reference electrodes - The pH electrode - Blood gas electrode - Active transducers and passive transducers - Strain gauges - Thermistor - Biomedical applications. (5)

SIGNAL CONDITIONERS: Instrumentation amplifiers - Current amplifiers - Isolation amplifier - Need for filters - Low pass, High pass and Band pass active filters - Notch filters - Heated stylus and ink pen recorders. (5)

DIAGNOSTIC EQUIPMENTS I: Electrical and mechanical activities of the heart - Typical Electrocardiogram (ECG) - Electrocardiograph - Bipolar and unipolar leads - Einthoven triangle - Electrical activities of the brain - Electroencephalogram (EEG) - Various rhythms - EEG equipment - Muscle response - Electromyograph (EMG) - Nerve Conduction velocity measurements - Intensity - Duration characteristics. (5)


BIOTELEMETRY AND PATIENT SAFETY: Need for biotelemetry - Elements of telemetry system - Radio telemetry system - Physiological signals used in telemetry - TDM and FDM - Implantable units - Physiological effects of electrical current - Shock hazards from electrical equipments - Electrical accidents and their prevention. (6)

70
PHYSIOLOGICAL ASSIST DEVICES: Need for pacemakers - Pacemaker parameters and circuits - Demand pacemakers - Different modes of operation - DC defibrillator - Artificial heart valves - Heart lung machines - Artificial lung machines - Artificial kidney machine - Nerve and Muscle stimulator - continuous patient monitoring system. (6)

COMPUTER APPLICATIONS: Data acquisition systems - Analysis of ECG signals - Computerised Axial Tomography (CAT) Scanner - Ultrasonic scanner - Magnetic resonance imaging - Computer based patient monitoring system - Introduction to expert system and hospital management. (5)

TEXT BOOKS:

REFERENCES:

08E013 EMBEDDED SYSTEMS DESIGN 3 0 0 3

INTRODUCTION TO EMBEDDED SYSTEM: An embedded system, functional building block of embedded system, characteristics of embedded system applications, Challenges in embedded system design, embedded system design processes. (6)

ARCHITECTURE OF EMBEDDED SYSTEM: Computer architecture taxonomy, CPUs – programming input and output, supervisor mode, exceptions & traps, Coprocessors, memory system mechanisms - CPU bus - memory devices - I/O devices - component interfacing - Assembly and linking - basic compilation techniques. (10)

OS FOR EMBEDDED SYSTEMS: Introduction to RTOS, multiple tasks and multiple processes, context switching, operating system, scheduling policies, interprocess communication mechanisms. Introduction to µC/OS II. (10)

PERFORMANCE ISSUES OF EMBEDDED SYSTEMS: CPU Performance, CPU Power consumption, Analysis and optimization of execution time, program size, energy and power, Evaluating operating system performance, power optimization strategies for processes, Hardware accelerators. (7)

DESIGN & IMPLEMENTATION: Development and debugging, manufacturing Testing, Program validation and testing, Need of Distributed embedded architecture, P C Bus, CAN Bus, Design examples: GPS Moving map, Personal Digital Assistant, Elevator controller. (9)

TEXT BOOKS:

REFERENCES:

08E014 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3


80286 MICROPROCESSOR: Functional block diagram - Modes of operation – Real and protected mode – Memory management and protection features. (8)

80386, 80486 PROCESSORS: 80386: Functional block diagram - Programming model - Addressing modes and instruction set overview – Address translation - Modes of operation - 80486 processor - Functional block diagram - Comparison of 80386 and 80486 processors. (7)
PENTIUM MICROPROCESSOR: Introduction – Architecture – Special Pentium registers – Memory management. (6)


TEXT BOOKS:

REFERENCES:

08E015 PERSONAL COMPUTER SYSTEMS 3 0 0 3

PC PROCESSOR: 8086 Architecture - Addressing modes - Instruction set - Features of Pentium processors. (7)

AT ARCHITECTURE: System units - Task allocations of system board - Timer - DMA and interrupt controller - Memory map - I/O map - AT bus - (ISA) specifications - PCI bus - Extended memory and Expanded memory. (7)

PERIPHERAL INTERFACE: Keyboard - Speaker - Printer - Display adapters - VGA standard - Floppy disk and hard disk formats - CD ROM structure – USB Basics. (8)

ASSEMBLY LANGUAGE PROGRAMMING: Program Development stages - Macro Assembler - Directives (real mode only) - Linker - Debugger. (7)

STRUCTURE OF MS-DOS: BIOS - DOS kernel - Command processor - Boot record - File directory - MS-DOS booting process - Program segment prefix - COM and EXE files - BIOS and DOS interrupts - Structure of device drivers. (7)

WINDOWS: Structure of window systems - Windows 98 - System architecture - Device drivers for windows - Virtual memory management - Windows based applications - MS-DOS based applications. (6)

TOTAL 42

TEXT BOOKS:

REFERENCES:

08E016 ADVANCED COMPUTER ARCHITECTURE 3 0 0 3

INTRODUCTION: Computer architectural classification: Flynn’s classification – Data flow versus Control flow computers – Parallelism in uniprocessor systems – Balancing of subsystem bandwidth – Parallel processing applications. (3)


INTRODUCTION TO RISC ARCHITECTURE: Instruction execution characteristics – Instruction execution charts – Register files – Register optimization – Reduced Instruction Set Architecture – RISC pipelining – RISC versus CISC.

TEXT BOOKS:

REFERENCES:

08E017 ADVANCED DATA STRUCTURES


SORTING: Insertion sort, selection sort, shell sort, bubble sort, quick sort, heap sort, merge sort, radix sort – Algorithms and their time complexity.

SEARCHING: Linear Search, Binary search.


BINARY SEARCH TREES: Searching – Insertion and deletion of elements – Analysis.

AVL TREES: Definition – Height – Searching – insertion and deletion of elements, AVL rotations – Analysis.


BINOMIAL HEAP AND FIBONACCI HEAP: Binomial trees and binomial heaps – Operations on binomial heap – Structure of Fibonacci heaps – merge heap operations, decreasing a key and deleting a node – Bounding the maximum degree.

GRAPHS: Definition – Representations (Adjacency matrix, packed adjacency list and linked adjacency list) – Network representation – Graph search methods (Breadth first and depth first traversals).

DATA STRUCTURES FOR DISJOINT SETS: Disjoint set operations, linked list representation of disjoint set, disjoint set forests, union, find, analysis.

CASE STUDY: Google File System (GFS) Implementation

REFERENCES:
6. URL: http://labs.google.com/papers/gfs.html

Total 42
08E018 DATABASE MANAGEMENT SYSTEMS


RELATIONAL MODEL: Structure of relational databases – the relational algebra – tuple and domain relational calculus – modifying the databases.


FILE ORGANIZATION AND STORAGE: Heap file-hashing techniques-indexes-B-trees and B+ trees-secondary storage devices-RAID technology-different levels of RAID.


REFERENCES:

TEXT BOOKS:

08E019 COMPUTER NETWORKS


REFERENCES:
# 08E020 COMPUTER GRAPHICS

**GRAPHICS INPUT - OUTPUT DEVICES:** Raster scan Displays - Random scan displays - Direct view storage tubes - Flat panel displays - Mouse - Track Ball - Joy Stick - Digitizers - Touch panels - LCD.

**GRAPHICAL USER INTERFACE AND INTERACTIVE INPUT METHODS:** The user dialog - Input of graphical data - Input function - Interactive picture construction techniques - Virtual reality environments.

**TWO DIMENSIONAL GRAPHICS:** Basic transformations - Matrix representation and homogeneous coordinates - Composite transformations - Line drawing algorithms: DDA and Bresenham’s algorithms - Circle generation algorithms: Mid point circle algorithm - Point clipping - Line clipping: Cohen Sutherland algorithm - Polygon clipping: Sutherland Hodgeman algorithm - Line covering.

**RASTER GRAPHICS:** Fundamentals: generating a raster image, representing a raster image, scan converting a line drawing, displaying characters, speed of scan conversion, natural images - Solid area scan conversion: Scan conversion of polygons, Y-X algorithm, properties of scan conversion algorithms - Interactive raster graphics: painting model, moving parts of an image, feed back images.

**CURVES AND SURFACES:** Parametric representation of curves - Bezier curves – B-Spline curves - Parametric representation of surfaces - Bezier surfaces - Curved surfaces - Ruled surfaces - Quadric surfaces – Concatenation of two curve segments – Order of Continuity.

**THREE DIMENSIONAL GRAPHICS:** 3D transformations - Viewing 3D graphical data - Orthographic, oblique, perspective projections - Hidden lines and hidden surface removal.

**ANIMATION GRAPHICS:** Design of Animation sequences - Animation function - Raster animation - Key frame systems - motion specification - Morphing - Tweening.

**COMPUTER GRAPHICS REALISM:** Tiling the plane - Recursively defined curves - Koch curves - C curves - Dragons - Space filling curves - Fractals - Grammar based models - Graftals - Turtle graphics - Ray tracing.

**REFERENCES:**

# 08E021 SYSTEM SOFTWARE


**MACRO LANGUAGE AND MACRO PROCESSORS:** Macro instructions, features of a macro facility – implementation.

**LOADERS:** Loader schemes – compile and go loaders, general load scheme – absolute loaders – direct linking loaders and their design. Other loading schemes: linking loaders, overlays, dynamic binders.

**COMPILERS:** Introduction – Structure of a compiler – phases of a compiler - compiler writing tools.

**LEXICAL ANALYSIS:** Role of a lexical analyzer – finite automata – regular expressions to finite automata – minimizing the number of states of a deterministic finite automata – implementation of a lexical analyzer.


**INTERMEDIATE CODE GENERATION:** Postfix notation, Quadruples, triples , indirect triples – Representing information in a symbol table – introduction to code optimization – basic blocks – DAG representation – error detection and recovery - code generation.

**REFERENCES:**
08E022  INTERNET TOOLS AND JAVA PROGRAMMING

3 0 0 3


EXCEPTION HANDLING: Fundamentals - Exception types - Uncaught Exception - Using Try and Catch - Multiple catch clauses - Nested Try statements - Throw - Throws - Java Built-in Exception - Creating your own subclasses. (3)

MULTI THREADED PROGRAMMING: Java thread model - Priorities - Synchronization - Messaging - Thread class and runnable Interface - Main thread - Creating the Thread - Synchronization - Interthread Communication - Deadlock. (4)

I/O, APPLETS: I/O basics - Stream - Stream Classes - Predefined stream - Reading/Writing console input - Applet fundamentals - Native methods - GUI Components - Applets - Java Scripts – AWT / Swings. (12)

INTRODUCTION TO NETWORK PROGRAMMING: Fundamentals - Internet Addresses - Internet Protocols - DNS - Internet Services - Socket programming, UDP, TCP. (5)

JAVA DATABASE PROGRAMMING: JDBC – Database Connection and Table Creation – Execution of Embedded SQL Statements - ResultSet and ResultSetMetaData – Examples. (2)

Total 42

REFERENCES:

08E023  SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE

3 0 0 3

INTRODUCTION: Software Projects various other types of projects - Problems with software projects - an overview of project planning - Project evaluation - Project Analysis and technical planning - Project estimates - Preparation of Estimates - COCOMO model - Function Point Analysis - Putnam Model - Non-development overheads. (8)

ACTIVITY PLANNING: Project schedules - Sequencing and scheduling projects - Network planning models - Shortening project duration - Identifying critical activities. (8)

RISK MANAGEMENT: Resource allocation - Monitoring and Control - Managing people and organizing teams - Planning for small projects - Handling large projects - Divide and Conquer - Software Project survival. (8)

SOFTWARE CONFIGURATION MANAGEMENT: Basic functions, responsibilities, standards, configuration Management, Prototyping - Models of prototyping. (8)


CASE STUDY: Introduction to Project Management Tools – Typical Applications. (3)

Total 42

REFERENCES:

08E024 GRID COMPUTING


TEXT BOOK:

REFERENCE:

08E025 NANO COMPUTING


TEXT BOOK:

08E026 DIGITAL SYSTEM DESIGN

SYSTEM DESIGN USING PLDs AND CPLDs: Structure of Standard PLDs and Complex PLDs (CPLDs) – Design of combinational and sequential circuits using PLDs and CPLDs – Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.
INTRODUCTION TO FIELD PROGRAMMABLE GATE ARRAYS (FPGAs): Types of FPGA – Xilinx XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/Output Blocks (IOB) – Programmable Interconnection Points (PIP) – Introduction to ACT 2 family and Xilinx SPARTAN, VIRTEX, FPGA – Design examples. (7)


REFERENCES:

04ES01 LOW POWER SYSTEM DESIGN

1. Introduction
   a. System-level Power Estimation
   b. System-level Power Optimization
2. Introduction
   a. Power Management using Voltage Island Technique
   b. Energy (Power) Management Approach by ARM
   c. Low Power Design Example with Samsung AP based on ARM 920T
   d. IBM Low Power Design using PowerPC
   e. Conclusions
3. Background for Leakage Current
4. Power estimation and analysis
5. Power estimation in the algorithmic and RTL Level
6. Low Power Very Fast Dynamic Logic Circuits
7. Low Power Arithmetic Operators
8. Circuit Techniques for Dynamic Power Reduction
9. Leakage Reduction Techniques
10. Low-power & low voltage Interconnects in SoC
11. Lab Exercises and Case Studies

REFERENCES:
Laboratory Manual Prepared by EEE Department

Total 15

04ES02 METHOD AND ALGORITHM FOR SYSTEM DESIGN

1. Propagation delay, circuit timing, and adder design
2. System Synthesis of Digital Systems
3. Library Binding
4. Retiming
5. Scheduling
6. Resource Sharing
7. Synchronous Logic Optimization
8. Timing issues in multi-level logic optimization
9. Lab Exercises and case Studies

REFERENCES:
Laboratory Manual Prepared by EEE Department

Total 15

78
04ES03 LOW POWER HIGH PERFORMANCE MICROPROCESSOR DESIGN

1. Circuit Design for Low Power
2. Power aware Micro architecture Design
3. Power aware Micro architecture Modeling
4. Power aware Micro architecture metrics
5. Design for low power tools and Methodologies
6. Labs and exercises

Total 15

REFERENCES:
Laboratory Manual Prepared by EEE Department

DETAIL SYLLABI FOR INDUSTRIAL TRAINING

I. 08E100 INDUSTRY ORGANISATION STRUCTURE, SAFETY, ENVIRONMENT NEEDS

0 1 5 0 4

Plant layout - List of machine tools - Specifications - Operation done on each machine tool - Constructional arrangements of machine tools - various work holding and tool holding methods - Types of cutting tools used - Hand tools - Type of component and material of the component - Organizational structures - Industrial safety - Sales and marketing - Maintenance - Power distribution.

Total 210

II. 08E200 STUDY OF CONTROL ELEMENTS & WIRING

0 1 5 0 8

Study of important BIS - Different types of wirings: House - Industrial - Study of control elements: Switches - Relay - contactor - solid state relays - circuit breakers - Types of Cables - Accessories - Cable termination.

Total 210

III. 08E300 WINDING AND ELECTRONIC PRODUCT DESIGN

0 1 5 0 1 2

Study of different types of winding wires - Insulation materials - Stamping & Laminations - Preparation of coils - Hands on training in winding machine.

Total 210

IV. 08E400 INSPECTION AND TESTING OF PUMPS AND MOTORS

0 1 5 0 8

Study of constructional details of Servo, stepper & SR Motors

Total 210

V. 08E500 ELECTRICAL LIGHTING & QUALITY SYSTEM SKILL QUALITY SYSTEM SKILL

0 1 5 0 8

Design of electrical wiring diagram using ePLAN - Lighting system: commercial lighting - Consumer lighting - industrial Lighting - Road & landscape lighting - Flood lighting - LED lighting - Solar PV system installation and testing

QUALITY SYSTEM SKILL

Awareness of TOM, ISO 9000, etc. - Process capability studies - Rejection analysis - Six sigma applications - Calibration needs - Calibration authorities - Records - Charts - Applications - Form error understanding and verification - Case studies in quality systems.

Total 210
VI. 08E600 AUTOMATION COMPONENTS

SENSORS AND TRANSDUCERS LAB
Sensors lab - Study of different types of sensors: Inductive – capacitive –Photo electric – Magnetic - Encoder – Interfacing with controllers.

PLC Lab: Study of PLCs and automation components -Development of simple projects using PLC and Testing –Study of different types of Drives – Interfacing of drives with PLC.

Total 210

VII. 08E700 MANAGERIAL SKILLS, SOFT SKILLS AND HRM, GENERATION OF CREATIVE & INNOVATIVE IDEAS


Total 210

VIII. 08E800 INDUSTRIAL VISIT AND COLLOQUIUM I


Total 210

IX. 08E900 INDUSTRIAL VISIT AND COLLOQUIUM II


Total 210