

SEMESTER-III

NUMERICAL ANALYSIS AND PROGRAMMING (MA 3103)

Numerical computation and error, solution of algebraic and transcendental equations- Bisection method, Regula-Falsi method and Newton-Raphson method and their order of convergence. Iterative methods for system of non-linear equations. Linear system of equations: Gauss elimination method, Crout's method, Jacobi's method, Gauss-Seidel method. Computer programming of above methods.

Finite differences, difference operators and symbolic relations, difference of a polynomial, Interpolation, error in interpolation, Newton's forward and backward formulae, Lagrange's interpolation formula, Newton general interpolation formula, Numerical differentiation, error in numerical differentiation. Numerical integration: Newton's cote's formula, Trapezoidal rule, Simpson 1/3 rule, Simpson 3/8 rule and their error estimation. Computer programming of above methods.

Ordinary differential equations: Taylor's series method, Euler's method, Euler's modified method, Runge-Kutta method, Boundary value problem-linear and non-linear equations. Computer programming of above methods.

MATERIAL SCIENCE (B) (PH 3103)

Introduction: - Material Science and Engineering, classification of engineering materials, structure property relationship in materials, introduction to metals & alloys, Ceramics, polymers, composites.

Crystal Geometry: Introduction, the space lattices, and lattice points, Unit cell and primitive cell, crystal systems, Bravias lattices, crystal direction and planes, reciprocal lattice, Miller indices, coordination number and atomic packing factor and its determination for simple cubic and Hexagonal closed packed structure. Determination of crystal structure by X – ray diffraction.

Crystal Imperfections: Introduction, Classification of imperfection, Point, line and surface imperfection.

Phase Diagrams: The phase rule, single component system, Binary phase diagrams, and the lever rule. The iron-iron carbide phase diagram, Hume – Rothrey rules of alloying.

Oxidation and Corrosion: Oxidation, mechanism of oxidation, oxidation resistant materials, Corrosion, The principle of corrosion, various forms of corrosion, Protection against corrosion.

Diffusion in solids: Introduction, types and mechanism of diffusion, Fick's law of diffusion, the atomic model of diffusion. Experimental determination of diffusion coefficient, The Kirkendall effect.

Dielectrics: Introduction, Dielectric polarization, types of polarization, Temperature and frequency effects, Ferro electricity, and piezoelectricity.

Magnetic properties: Diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism and ferrimagnetism, soft and hard magnetic materials, magnetic moment due to electron spin

Electrical properties : The free electron theory, Fermi- Dirac distribution function, conduction by free electron, Mobility and conductivity, energy band theory of solids, Insulators, semiconductors, metals, potential field in a metal, bond and free electron, Superconductivity and superconducting materials, Type I and Type II superconductors, The Meissner's effect.

MATHEMATICS – III (MA 3104)

LAPLACE TRANSFORMATION :- Definition of Laplace transform and linearity and shifting property, Laplace transform of elementary functions, Inverse Laplace transform, Laplace transform of derivative and integration, convolution theorem, Solution of differential equation by Laplace transform, Unit Step function, Unit impulse function.

VECTOR CALCULUS :- Differentiation of vector function, gradient, divergence, curl and their geometrical or physical interpretation, Line, Surface and Volume integrals, Statement of Green's Theorem , divergence theorem and Stoke's theorem and their applications. Curvilinear co-ordinates.

FOURIER SERIES :- Fourier series, Dirichlet's conditions, Half Range series.

FOURIER TRANSFORM :- Definition of Fourier Transform, linearity, shifting, frequency theorem, Fourier transform of derivatives and Dirac-delta function, Inverse Fourier transform, Fourier Sine and Cosine transform, Solution of simple differential equation by Fourier transform method.

Z- TRANSFORMATION :- Definition, Z-transformation of standard sequences, linearity property, Shifting theorem, inverse of Z-transformations, Scaling property of Z-transformation, differentiation of Z-transformation, convolution of sequences, solution of difference equations by Z-transformation.

ELECTRICAL MACHINE-I (EE 3102)

Transformer:

Single phase and three phase, Equivalent circuit , Voltage Regulation, Losses and Efficiency, Special multiphase transformers and their applications, Parallel operation , phase conversion, Auto transformer.

Electromechanical Energy conversion Principles:

Energy Balance, energy in singly excited magnetic system, mechanical forces and energy, state function, variables, co-energy, singly excited electric field system, multi-excited magnetic field systems, dynamic equations.

DC Machine:

Construction, Excitation, Characteristics , Commutation, armature reaction, testing, losses and efficiency, speed control of DC motors and application in drives. d.c. generator operation, parallel operation of dc generators.

Induction Machine:

Three phase induction motor- construction, characteristics , starting, braking and speed control, Induction generator, its controllers and application, Schrage motor.

NETWORK THEORY(EE 3103)

Linear Time Invariant first order and second order circuits- Analysis using integro-differential and Laplace transform approach.

Coupling elements and coupled circuits.

Network Graphs and their application in network analysis, Tellegen's theorem.

State equations.

Natural frequency

Network function.

Two port networks.

Network Synthesis PRF, synthesis of one port L-C,R-C & R-L network.

DIGITAL ELECTRONICS & INTEGRATED CIRCUITS (EC 3102)

Number systems, Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, EBCDIC, Gray, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic.

Boolean algebra, Venn diagram, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method and Quine Mc Clauskey method

Combinational circuits- adder, subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator.

Design of combinational circuits-Programming logic devices and gate arrays.

Sequential Circuits- Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology

Different types of A/D and D/A conversion techniques.

Different Logic families- TTL, ECL, MOS and CMOS, their operation and specifications.

Memory Systems: RAM, ROM, EPROM, EEROM

SEMESTER-IV

MATHEMATICS – IV (MA 4105)

SPECIAL FUNCTIONS :- Series solution of differential equations, Bessel and Legendre's equations and their series solution, elementary properties of Bessel's function and Legendre's polynomial.

COMPLEX VARIABLE:- Analytic function, Cauchy- Riemann equation. Complex Integration, Cauchy's theorem and Cauchy Integral formula. Taylor and Laurent's expansion. Poles and Residue, Residue theorem. Conformal transformation, Bilinear and Schwartz's transformations.

PARTIAL DIFFERENTIAL EQUATION :- Formulation of partial differential equation, Linear and non-linear partial differential equations of the first order, Lagrange's method and Charpit's method. Higher order Partial Linear differential equations with constant coefficients. Method of separation of variables. Equation of vibrating strings, heat flow, Laplace's two dimensional equation and simple problems.

PROBABILITY AND STATISTICS (MA 4106)

Probability: classical and axiomatic definitions, addition law, conditional probability, multiplication law, total probability, Baye's theorem and independence of events.

Random variables: Discrete and continuous random variables, probability mass, probability density and commutative distribution functions. Mathematical expectation, variance, moment and moment generating function, Chebyshev 's inequality.

Regression Analysis: Linear regression, principle of least square, non-linear regression, correlation, coefficient of correlation, Rank correlation.

Distributions: Binomial, Hypergeometric, Geometric, Poisson and Normal distributions.

Sampling Distribution: Population samples, sampling distribution, estimate for population mean and variance, point of estimation, confidence interval for mean and variance of normal population, Testing of hypothesis, the critical and acceptance region, two type of errors, Chi-square, t-student and F distributions.

Analysis of Variance: completely randomize design and randomized block design, Quality control, control charts(X-chart, R-chart, P-chart and C-chart).

ANALOG ELECTRONICS (EC 4103)

Transistor Biasing and Stability: Self Bias-CE, CC, Compensation techniques. Voltage, current, transresistance & transconductance amplifier.

High frequency model of transistor.

Power amplifiers – Class A, B, AB, C, Tuned amplifier. Push –pull amplifiers.

Operational Amplifier: Differential Amplifier using BJT and FET, Internal structure of Op-amp, Constant current source (current mirror etc.), level shifter, Ideal and practical OpAmp. Comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Linear & Nonlinear Precision Rectifier

Multivibrator – Monostable, Bistable, Astable. Ckts & Timer. Monostable and astable operation using 555 timer.

Linear voltage regulator : series and shunt.
Switched mode power supply.

Function generator, wave shapers.
V-I, I-V, V-F & F-V converters. VCO, PLL lock-in amplifier.

POWER SYSTEM-I (EE 4104)

Generation of Electric Power: -
Introduction to thermal, hydro, nuclear and gas power plants and non conventional power plants.

Transmission and distribution systems:-
DC 2 wire and 3 wire systems, AC single Phase, three phase and 4 wire systems, Comparison of copper efficiency.

Overhead Transmission lines:-
Types of conductors, Line parameters, Calculation of Inductance and capacitance of single and double ckt transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent ckts of short, medium and long lines, line performance- regulation and efficiency of short, medium and long lines, series & shunt compensation, Introduction to FACTS.

Overhead Line Insulators:-

Type, String efficiency, Voltage distribution in string of suspended insulators, grading ring.

Mechanical design of Transmission Line:-

Different types of tower, sag. Tension calculation, string charts, vibrations and damping, corona, corona losses, interference of power lines with communications cks.

Cables:-

Types, Calculation of capacity of cables, charging current, stress, grading, heating of cables. Construction and characteristics of HV & EHV cable.

Problems of Long AC lines:-

Ferranti effect, charging current, stability etc.

Power Factor Improvement:-

Disadvantages of low pf, pf correction at power Stations, Substation & industry, cost analysis of pf improving plants.

INSTRUMENTATION-I (EE 4105)

Electrical measurements:-

errors in measurement, Classification of errors, statistical analysis of errors, Probable error and limit errors, Calculation of limiting errors.

Potentiometer: DC and AC

Measuring Instruments:-

Fundamentals ,operation and construction of galvanometer(DC & AC), ammeter and voltmeters, wattmeters, extension of range of instruments, energy-meter, frequency meter and single phase reactive power measurements, single phase power factor meter, megger , multimeter , trivectormeter.

Instrument Transformer:-

CT & PT, ratio& phase angle errors.

Measurement of resistance , inductance and capacitance

High voltage measurement:-

Surge and impulse test and oil testing set

Magnetic measurement: ballistic galvanometer and flux-meters, Determination of BH curve and hysteresis loop, separation of hysteresis and eddy current losses by using loyd, Fisher square.

Electronic Instruments:-

CRO and its uses , Special purpose CRO , VTVM, Principles of digital instrumentation.

SIGNALS AND SYSTEMS (EE 4106)

Classification of Signals and Systems, Various System Representation Techniques, Differential, difference and State Space Representation, Fourier Transforms and series application to analysis of System, Laplace Transform-its Property and its application to System analysis, DFT and FFT, Z Transforms- its Property and application. Random Variables and random Process, Characterization of Random Variables and Random Process, Linear Systems and Random Signals, Dynamical Systems.

SEMESTER-V

MICROPROCESSOR AND INTERFACING (EE 5109)

8085:- Architecture, introduction, Pin function, Internal Organization.

8085 Programming:- Instruction sets, Introduction , Programming algorithm , Instruction timing

8085 interrupts, 8085 Interfacing with memory, 8085 Interfacing with I/O, I/O ports, DMA and Interrupt controller chips, Introduction to 8085, application to control and instrumentation.

Introduction to 8086:- Architecture, Pin Configurations, Instruction set.

POWER SYSTEM-II (EE 5110)

Introduction to control area and power grid operation and its advantages

Single line representation, p.u. system.

Economics of power system

Symmetrical components , Measurement of zero, positive, and negative sequence current and voltage and symmetrical faults, unsymmetrical faults, symmetrical three phase faults of synchronous machine, short ckt current and reactance of synchronous machine.

Power systems stability and its analysis, load flow analysis and load flow modeling, load frequency control, automatic voltage regulator, optimal power flow.

INSTRUMENTATION-II (EE 5111)

POWER SYSTEM MEASUREMENT-

Dynamics of instruments, Measurement of cable faults and earth resistance.

TRANSDUCER-

Types and classification, selection, strain gauge, inductive and capacitive,

Piezoelectric and hall effect transducers, temperature transducers, optical transducers,

Special purpose transducers.

Shaft angle encoder, digital displacement transducers,

Measurement of velocity, Acceleration, force, flow of liquids, liquid levels, digital temperature measurement.

Basic concepts for smart sensors and their application,

Wave analysis, wave analyzer,

Display and recording devices, vector voltmeter, frequency meter, universal counter and its uses, q-meter.

Data acquisition system, Analog and digital signal conditioning and its instrumentation scheme. AC and DC telemetry, signal filtering, Averaging, signal correlation and coding power measurement at high frequency.

ELECTRICAL MACHINE-II (EE 5112)

SYNCHRONOUS MACHINE :-

Construction and types of windings, generators and motors operations, Armature reaction, phasor diagram, Salient pole machine, Two axis theory, d-q model, Voltage regulation, operation of synchronous machine as infinite bus, parallel operation of synchronous generator, Synchronization, Starting of synchronous motor, V- curves, torque angle characteristics and hunting, Dynamics of synchronous machine,

Single phase Motors - induction type, Double revolving field theory, equivalent Ckt. Characteristics & starting of single phase motor, shaded pole machine, synchronous type, Hysteresis motor, Reluctance motor, Stepper motor, Special electric motors- Switched reluctance motor, PMBLdc motor, tachometer, Two phase control motor, Synchro.

Applications: Hoisting Systems like Cranes, Electric Shovels, Conveyor, Transport System, Drilling operations etc.

E.M.F (PH 5104)

Gauss's Law , potential Functions Poisson's and Laplace's Equations, Electrostatic Uniqueness Theorem, Ampere's Law, Magnetic scalar and Vector Potential.

Introduction of Electromagnetic radiation, Plane wave propagation in isotropic, and anisotropic media Skin effect, e.m. Impedance, energy density.

Reflection and refraction of plane waves, surface Impedance, Transmission line Theory, VSWR, RF and UHF Transmission Lines, UHF lines as circuit elements, Quarter wave Impedance, Inverting Transformer, single stub matching. Guided waves, waves between parallel planes, TM and TE / TEM waves, Rectangular, spherical wave guide Earth ionosphere as a resonant cavity

PROPAGATION: - Different modes of radio wave propagation, ionospheric Propagation, MUF, Critical frequency, skip distance, dust propagation, tropospheric propagation.

ANTENNA: - General solution of Maxwell's Equation, Expression for E and H in term of potentials, Retarded potentials, Antenna Definition, Function of as Antenna, properties of an Antenna, Antenna parameters, Basic Antenna Elements, Radiation Mechanics, Radiation fields of an Alternating current Element (Or Oscillating Electric Dipole), radiation from half wave Dipole. Basic of small circular-loop Antenna, Monopole Antenna, Horn antenna, parabolic reflector.

SEMESTER-VI

MANAGEMENT CONCEPT & TECHNIQUES (EE 6114)

ENGINEERING ECONOMY:

(a) Simple and compound interest, annuities (b) depreciation: cause and methods (c) comparison of alternative and replacement studies: (i) equivalent annual cost method, (ii) present worth method, (iii) rate of return method.

ACCOUNTING :

(a) Double entry book keeping, (b) journal, (c) ledgers, (d) manufacturing account: profit and loss accounts, (e) balance sheet.

COSTING:

(a) cost and cost accounting, elements, (b) break even analysis, determining selling price and profitability, (c) over-head cost allocation, (d) costing system, job costing, unit costing, process costing, operating cost, departmental cost, (e) cost control : actual and standard cost, budget and budgetary control.

ENTREPRENEURSHIP DEVELOPMENT :

(a) Introduction to entrepreneurship, (b) motivation, (c) psychological factors, risk taking behavior, (d) rural entrepreneurship, (e) self employment.

MANAGEMENT AND ORGANIZATION :

(a) Principle of management, (b) elements of management, planning, organizing direction and control, (c) organization structure and charts, line, staff functional and committee organization.

INDUSTRIAL MANAGEMENT :

(a) Industrial ownership LP proprietorship, partnership, Joint Stock Company and cooperative societies, (b) site selection, (c) plant layout: process oriented product oriented layouts, line balancing.

PRODUCTION MATERIALS MANAGEMENT :

(a) Production types: job order, batch and mass production, (b) inspection and quality control, (c) inventory control, economic order quantity.

OPTIMIZATION TECHNIQUES :

(a) Linear programming: graphical method, analytical method of solution (two variables), (b) CPM & PERT.

PERSONAL MANAGEMENT :

(a) Functions: manpower planning, recruitment, selection, training, promotion, discipline, welfare, (b) job evaluation, (c) merit rating, (d) wages and incentives

MARKETING MANAGEMENT :

(a) Market research and sales forecasting, (b) sales management, (c) advertisement and sales promotion

MICROPROCESSOR & MICROCONTROLLER (EE 6115)

Introduction to advance microprocessor: 8088 onwards upto P-IV processors, parallel processing, etc.

Types, selection and applications of microcontrollers, architectures, 8051, Instruction sets, Interfacing, medical applications, process control application and automation.

CONTROL SYSTEM-I (EE 6116)

Introduction and types of feedback control system, Block diagram and signal flow graph analysis, Mathematical modeling of physical system, Linear and nonlinear systems, transportation lag, dual network

Time domain analysis of control system, Stability concept, Routh stability criterion, Root locus technique, frequency domain analysis, Bode plot, Nyquist plot,

Time domain and frequency domain design of control system, state variable formulation, analysis and solution, controllability and observability, Controllers and their tuning, performance index and error criterion.

PROTECTION OF POWER APPARATUS & SYSTEM (EE 6117)

Basic concept & components of power system protection, types of relays- their operating principles, characteristics & their uses.

Protection of generators, transformers, busbars & transmission lines, distance and carrier current protection, induction motor protection.

Auto reclosing, static relay and comparators, theory of arc interruption, types of ckt. Breakers- air, air-blast, air break, oil, vacuum & SF₆. circuit breaker rating & testing of ckt. Breakers.

Protection of lines from arc voltage, earthing, Digital Relaying, Microprocessor & computer based protection schemes.

POWER ELECTRONICS (EE 6118)

POWER SEMICONDUCTOR DEVICES:

History of development of power electronics devices, constructional features, characteristics, rating and specification, gate/base drive circuits, protection including cooling, application. Consideration of diodes, SCRs, GTO, BJTs, MCT, MOSFET, IGBT.

AC TO DC CONVERTERS:

Operation and analysis History of single phase and multiphase uncontrolled and controlled rectifiers with R, RL and back EMF load, Effect of source inductance, free wheeling effect, power factor improvement methods for phase controlled rectifiers, filters.

AC TO AC VOLTAGE CONVERTERS:

Operation and analysis of single phase integral cycle and phase controlled converters, Configuration of three phase controllers.

DC TO DC CONVERTERS:

Coppers classification, step down, step up and four quadrant converters operation, analysis and control with R,RL and EMF load, current and voltage commutation circuits.

DC TO AC CONVERTERS:

Single phase and three phase bridge inverters, VSI and CSI, voltage control, PWM & square wave operation, Harmonics and their reduction techniques.

CYCLOCONVERTERS:

Single phase and three phase configuration & operating principles.

Combined HVAC and HVDC Systems.

SEMESTER-VII

CONTROL SYSTEM- II (EE 7119)

Sampling Techniques and Reconstruction.
Transform analysis of Sample data systems.
Transform design of digital control.
State space analysis of sampled data systems.
Design of digital controls.
Self timing controls.
Microprocessor based position control system, furnace control
& Stepper motor control.

COMPUTER ADDED POWER SYSTEM (EE 7120)

Representation of power system components: Mathematical Modeling, Power System formulation, GS, NR FDLF methods.
Optimal power system operation :
Unit commitment, Reliability, Economic dispatch, Emission dispatch, optimal load flow, Optimal Hydrothermal scheduling.
Power System Security.
State estimation
Load forecasting
SCADA: Automatic Generation Control

MODELLING & SIMULATION (EE 7121)

Fundamentals of modeling , Classification of simulation models, the simulation process
System investigation, model formation, validation & translation, time-flow mechanism,
design of computer simulation experiments, simulation of complex discrete event system
with application in industrial & service organizations,

Tactical planning & management aspects, Random variable generation & Analysis.
Case studies: Automatic Generation control, EDC etc.

List of Elective for Seventh Semester:

ELECTIVES I & II

1. DIGITAL SIGNAL PROCESSING (EE 7122)
2. ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM (EE 7123)
3. NEURAL NETWORKS (EE 7124)
4. MACHINES AND DRIVES DYNAMICS (EE 7125)
5. CAD OF ELECTRICAL MACHINE (EE 7126)
6. OBJECT ORIENTED PROGRAMMING LANGUAGE (EE 7127)

7. NON-CONVENTIONAL ENERGY (EE 7128)
8. MANAGEMENT INFORMATION SYSTEM (EE 7129)
9. PROCESS CONTROL & INSTRUMENTATION (EE 7130)
10. MATLAB APPLICATION (EE 7131)
11. VIRTUAL INSTRUMENTATION (EE 7132)
12. MANEGERIAL ACCOUNTING AND FINANCIAL MANAGERMENTS (EE 7133)
13. COMPUTER NETWORKS (IT 6103)
14. DATA STRUCTURE (CS 3101)

1. DIGITAL SIGNAL PROCESSING (EE 7122)

Review of Signals and Systems, Sampling and data reconstruction processes. Z Transforms. Discrete linear systems. Frequency domain design of digital filters. Quantization effects in digital filters. Discrete Fourier transformation and FFT algorithms. High speed convolution and its application to digital filtering.

2. ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM (EE 7123)

1. INTRODUCTION TO A.I.
Overview, concept of knowledge, A.I. Programming and languages (LISP and Prolog)
2. KNOWLEDGE REPRESENTATION :
Symbolic logic, dealing with in-consistencies and uncertainties, structured knowledge, object oriented representation.
3. KNOWLEDGE ORGANISATION AND MANIPULATION:
Searching and Matching Techniques, Knowledge organization and management.
4. PERCEPTION, COMMUNICATION AND EXPERT SYSTEM(VERY BASIC)
Natural language processing, pattern recognition, visual image understanding, Expert system architecture.
5. KNOWLEDGE ACQUISITION (ONLY BASIC)
General concept in knowledge acquisition, learning by induction, Examples of inductive learners, Analogical and explanation basic learning.

3. NEURAL NETWORKS(EE 7124)

Introduction to Biological Neural networks ; Basic anatomy and physiology of a nerve cell ; mathematical model of a biological neuron ; networks of neurons ; a simple model of a neuron and its applications to a classification problem ; linear separability and linear dichotomies ; nonlinearly separable problems ; learning with layered networks ; back-propagation ; recurrent neural networks ; the Hopfield networks ; application to

optimization tasks ; unsupervised learning – both co-operative and competitive ; Oja and Sanger's rules ; Principal component analysis ; Kohonen's self organizing feature map ; applications of unsupervised learning ; Reinforcement learning ; Support Vector Machines ; Current Trends and Future Directions.

4. MACHINES AND DRIVES DYNAMICS (EE 7125)

General Volt – ampere & torque equations under stationary & rotating reference frames. Instantaneous symmetrical components & generalized operational equivalent circuits. Space vector concepts. Modeling of D.C. machines; analysis under motoring & generating. Simulation for transient & dynamic conditions. Modeling of synchronous machines; d-q transformations fixed to field structure – steady state & dynamic equations. Phasor diagram for cylindrical rotor & salient pole machines.-electromagnetic & reluctance torque. Response under short circuit conditions. Modeling of induction machines. Equations under stationary & rotating reference frames, derivation of equivalent circuits, correlation of inductances, run up transients, dynamics under load change, speed reversal & braking, unbalanced & asymmetrical operation. Modeling & analysis of permanent magnet, switched reluctance & stepper motors, development of computer software using latest simulation tools to predict the behavior of different machines.

5. CAD OF ELECTRICAL MACHINE (EE 7126)

Basic design methodology and engineering consideration. Properties of electric magnetic and insulating materials. Choice of materials, frames etc. computerization of design procedures, optimization techniques and their application to design problems. Design of large and FHP motors. Data based and knowledge based expert systems. Development of PC based software, exercise on design using standard software.

6. OBJECT ORIENTED PROGRAMMING LANGUAGE (EE 7127)

Introduction to c++ : Object Oriented Technology , Advantages of OPP , Usage of OPP , Input – output in c ++, Tokens, Keywords, Identifiers, Data Types C++ , Derives data type , The void data type , Type Modifiers , Typecasting , Constant , Operator , Precedence of operators , Referencing and Dereferencing , comma operator , Memory Management operator , Strings .

Control Structures : Decision making statements like if-else, Nested if-else , jump go-to , break continue , switch case , Nested switch case , Loop statement like for loop, while loop, do-while loop.

Functions : main () function ,parts of function , passing arguments , L value and R values, return by reference, Default arguments, Inline function , Function overloading , Precaution with function overloading ,Library function .

Classes and objects : Structure in C ++ ,Class ,Object ,public private , protected keywords, Member functions ,Data Hiding Static member variables and functions , Static Objects , Array of objects , Objects as function Arguments , Friend functions ,The const member function, Recursive member function , Local classes, Empty , static and

const classes ,Member function and Non- member functions , The main() as a member function, Local vs Global object.

Constructors destructors : Application with constructors ,constructors with arguments , Overloading constructors ,copy constructor , The const objects, calling constructors and destructors ,Anonymous objects , private constructor & Destructor ,Dynamic Initialization Using constructor ,The main() as a constructor and Destructor, Constructor & Destructor with static Members.

Operator Overloading &Type conversion : The keyword operator , Operator return type ,Overloading unary & binary operation , overloading with friend function , Type conversion .

Inheritance : Single, Multiple , Multilevel , Hierarchical ,Hybrid ,and Multi-path inheritance , Virtual Base class, Constructor Destructor and Inheritance , Abstract class , Pointer and Inheritance ,Overloading Member function , Pros and cons of Inheritance.

Pointer and Array : Void pointers , Wild pointer ,Pointer to class , Pointer to object , The this pointer , Pointer to Derived classes and Base Classes, Pointer to members , Accessing of object & Void Pointer , Arrays, Arrays of classes.

C ++ & Memory : The new & Delete operator, Help consumption , Overloading new & delete operator , Execution sequence of constructor & destructor ,Dynamic object , Specifying address of the object .

Binding ,Polymorphism & virtual function : Binding in C++ , Pointer to Derived class objects , virtual function , Pure virtual function , Abstract class , virtual function in derived class , object slicing , constructor and virtual function ,virtual destructor , Destructor and virtual function .

Files: File stream classes, checking for errors, File opening modes, File pointer, Random access operation , etc.

Templates: Need of templates , Normal function Templates , class templates , Overloading of templates function , Member function templates.

Exception Handling : The keyword try, throw and catch , Re-throwing exception , Multiple catch statement , Catching multiple exceptions, Exception in constructors & Destructors, Exception & operator overloading, and Exception & Inheritance.

7. NON-CONVENTIONAL ENERGY(EE7128)

- 1) Indian and global energy sources energy demand energy planning and exploited various source of energy.
- 2) Bio-gas: aerobic and anaerobic bio-conversion process, raw materials, Bio-gas properties plant technology.
- 3) Wind Energy: Fundamentals, aerofesil design, wind power system, economic & selection of wing mill, recent development.
- 4) Solar energy: solar radiation, solar thermal power solar energy storage, recent development in solar power plants.
- 5) Fuel Cell: reversible and ideal fuel cell, other types of fuel cell efficiency of full cell
- 6) Geo-Thermal energy: Hot springs, steam ejections site selection, power plants, advanced concepts.

- 7) Ocean energy: power plant based on ocean energy availability, theory and working principle of ocean thermal energy conversion
- 8) Magneto-Hydro dynamics (MHD): Principle of working performance and limitations
- 9) Wave and tidal wave: Principle of working performance and limitations
- 10) Thermo-electrical and thermo-ionic conversion: Power generation properties of thermoelectric materials, fusion, plasma generators

8. MANAGEMENT INFORMATION SYSTEM (EE 7129)

Introduction to MIS: concept, Definition, etc

Role and Importance of Management: Approaches to Management, Functions of the Manager, Managers & the Environment as a control system, etc

Process of Management: Management Effectiveness, Planning, Organising, Staffing, Coordinating & Directing, Controlling, etc

Organisation Structure & Theory: Basic Model, Modifications, Organisational Behaviour, Organisation as a system, MIS: Organisation

Strategic Management of Business: Corporate Planning, Strategic planning, development of Business Strategies, Type of Strategies, Short-Range Planning, MIS Business planning

Decision Making: Concepts, Decision Methods, Tools and Procedures, Behavioural concepts, Organisational Decision Making, MIS and Decision Making concepts

Information: Concepts, Classification, Methods of Collection, Value, Organisation and Information, MIS and the Information Concepts

Systems: Concepts, Control, Types, Handling Complexity, Implementation Problems, MIS and system Concept

System Analysis & Design :Introduction, Need, System Development Model, Structured System Analysis & design, Computer System Design, MIS and System Analysis

Development of MIS: Long Range Plans, Class of Information, Information Requirement, Implementation of MIS Quality in the MIS Organisation for development of the MIS, MIS: the Factors of Success and Failures

Choice of Information Technology: Nature of IT Decisions, Strategic Decision, Configuration Decision, Evaluation, IT Implementation Plan, Choice of IT and the MIS

Application of MIS: Application in Manufacturing Sector, Applications in Service Sector, Decision Support Systems, Enterprise Management Systems

Technology of Information System: Data Processing, Transaction processing, Application Processing, Information System Processing, TQM of Information Systems, Human Factor & User Interface

Business process Re-Engineering: Business Process Model, Value stream Model, Relevance of IT, MIS and BPR

Electronics Business Technology: Models, Electronic payment Systems, Security in E-Business, MIS and E-Business

Web: A Tool for Business Management : Internet & Web and Process of Management, Strategic Management under Web, Web enabled Business Management, Application System Architecture in Web, MIS in Web Environment

9. PROCESS CONTROL & INSTRUMENTATION (EE 7130)

Transducers: Temp. transducers, Strain gauges, Pressure and Flow transducers, digital transducers. Instrumentation for Computer Control and Data Transmission: Signal transmission, Common mode noise, Noise suppression Signal termination, Multiplexers, Microprocessor Based Data Acquisition Systems: Instrumentation amplifiers, sample and hold circuits, Digital to Analog and Analog to Digital Converters, Data Acquisition Systems. Process Control Fundamentals: Proportional band, Proportional plus derivative, proportional plus derivative plus integral control, Cascade control, feed forward control, Direct digital control, Ratio control. Development of Digital Control Algorithms: First order lag filter, PID Algorithms, Velocity Algorithms, Dynamic compensation algorithm, Dead time compensation algorithm, Kalman set-point controller, Z-transform based control algorithms. Programmable Logic Controllers (PLC): Relay logic Vs. Programmable Controllers, Architecture and important features of programmable controllers, Ladder programming, PC programming, Typical applications, Automatic Test Equivalent (ATE): IEEE 488 Bus-Specifications, Data transfers, Microcontrollers for control applications: 8048/Intel8051; Intel8096.

10. MATLAB APPLICATION (EE 7131)

11. VIRTUAL INSTRUMENTATION (EE 7132)

(Detail Syllable for S.N. 10 & 11 will be provided later on)

12. MANAGERIAL ACCOUNTING AND FINANCIAL MANAGERMENTS (EE 7133)

Accounting principles underlying preparation of financial statements, managerial uses of financial data .ratio analysis and interpretation of financial statement. Cost concepts . cost volume- profit relationship and profit planning. Break even analysis. Incremental analysis and managerial decision. Budgetary control system and preparation of various types of budgets. Time value of money. Cost of capital and capital budgeting. Determinants of working capital and its measurement. Cash management. Receivables management. Introduction to international finance; risk management in international operation

13. COMPUTER NETWORKS (IT 6103)

Overview of Data Communications and Networking

Introduction, Network Models

Physical Layer

Signals, Digital Transmission, Analog Transmission, Multiplexing, Transmission Media, Circuit Switching and Telephone Network.

Data Link Layer

Error Detection and Correction, Data Link Control and Protocol, Point to Point Access PPP, Multiple Access, Local Area Networks : Ethernet, Wireless Lans, Connecting Lans,

Backbone Networks, Virtual Lans, Cellular Telephone and Satellite Networks, Virtual Circuit Switching.

Network Layer

Host-to-Host Delivery :Internetworking, Addressing and Routing, Network Layer Protocols : ARP, IPv4, ICMP, IPv6, and ICMPv6, Unicast and Multicast Routing : Routing Protocols.

Transport Layer

Process-to-Process Delivery : UDP and TCP, Congestion Control and Quality of Service.

Application Layer

Client-Server Model : Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), and File Transfer (FTP), HTTP and WWW, Multimedia.

Security

Cryptography, Message Security, User Authentication, and Key Management, Security Protocols in the Internet.

14. DATA STRUCTURE (CS 3101)

Overview of C Language

Time and Space analysis of Algorithms- Order Notations.

Linear data Structures – Sequential representations – Arrays and Lists, Stacks, Queues and De-queues, strings, Application.

Linear Data Structures, Linear linked lists, Circularly linked lists. Doubly linked lists, application.

Recursion – Design of recursive algorithms. Tail Recursion, when not to use recursion, Removal of recursion.

Non-linear Data Structure: Trees – Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height-balanced and weight-balanced trees, B-trees, B+ -trees, Application of trees; Graphs-Representations, Breadth-first and Depth – first Search.

Hashing – Hashing Functions, collision Resolution Techniques.

Sorting and Searching Algorithms- Bubble sort, Selection Sort , Insertion Sort, Quick Sort, Merge Sort, Heap sort and Radix Sort.

File Structures – Sequential and Direct Access. Relative Files, Indexed Files –B + TREE as index, Multi-indexed Files, Inverted Files, Hashed Files.

SEMESTER-VIII

DRIVES & CONTROL (EE 8134)

Details of PWM inverter fed ac drives with different forms of feedback control, bang-band and sliding mode structures, realization on microcomputer based systems. Scalar and Vector control of ac motor, flux estimators and their shortcomings, hardware realization, start up control of induction motors with PWM and flux vector structures. Present day shortcoming of inverter fed induction motor drives-bearing erosion, shaft fracture and efficiency problems involvement of soft switching inverters and impact on ac drive performance SR motors and PM motors drive control. Basic Aspects of Design of Power Electronic Modules and Microprocessor Controllers.

INTELLIGENT CONTROL (EE 8135)

Conventional control review , Feedback linearization , Robust and adaptive control , Fuzzy system : Introduction to fuzzy logic , Examples , fuzzy logic based identification and control , adaptive fuzzy control , Neural networks : Basics , Neural network based identification and control of nonlinear systems , examples . Various other soft computing techniques for control applications . Introduction to reinforcement learning.

List of Elective for Eighth Semester:

- 1. DSP BASED CONTROL OF ELECTRIC DRIVE (EE 8136)**
- 2. UTILIZATION AND TRACTION (EE 8137)**
- 3. POWER QUALITY & RELIABILITY (EE 8138)**
- 4. MECHATRONICS (EE 8139)**
- 5. HIGH VOLTAGE ENGINE RING (EE 8140)**
- 6. INTELLIGENT INSTRUMENTATION (EE 8141)**
- 7. POWER ELECTRONICS APPLICATIONS IN POWER SYSTEM (EE 8142)**
- 8. IDENTIFICATION TECHNIQUES AND ADAPTIVE CONTROL (EE 8143)**
- 9. POWER SYSTEM DYNAMICS AND CONTROL (EE 8144)**
- 10. COMPUTER ORGANISATION & ARCHITECTURE (EE 8145)**
- 11. HVDC TRANSMISSION (EE 8146)**
- 12. INTELLIGENT ALGORITHMS FOR POWER SYSTEMS (EE 8147)**
- 13. MODELING AND ANALYSIS OF ELECTRICAL MACHINES (EE 8148)**
- 14. BIOMEDICAL INSTRUMENTATION (EE 8149)**
- 15. NEURAL NETWORKS & FUZZY SYSTEM (EE 8150)**
- 16. VLSI DESIGN (EC 7111)**
- 17. EMBEDDED SYSTEM DESIGN (EE 8151)**
- 18. COMPUTER VISION (CS 7118)**

1. DSP BASED CONTROL OF ELECTRIC DRIVE (EE 8136)

Features of DSP in comparison to those of ordinary processors, computational advantage handicaps regarding analog & digital interface. Communication advantages, harmonic analysis in real time using a DSP specific assembly language features for a DSP. On chip RAM & external RAM I/O interface. PWM & firing pulse generation through a typical DSP, look-up tables & real time computation. Interfacing & actuation circuits for DSP based controllers. Realization of computationally intensive algorithms like variable structure, adaptive & neural network schemes for drive systems.

2. UTILIZATION AND TRACTION (EE 8137)

1. Industrial Drives:

Characteristics of Electrical Motors and their Particular application for Industrial Drives. Motor Enclosures, Bearing, transmission of Drives, Choice of Motor, Motors used for Lifts, Cranes and General Purpose Machines, Typical application in Sugar, Textile, Paper and Steel Industries, Motors used in Mining Operations, Rating of Electric Motors, Calculation of size load equation of flywheels Electric breaking: Plugging, Dynamic and regenerative breaking, breaking current torque, speed time curves (number of revolutions made before stop)

2. Traction:

electric traction, general features, traction motors and their characteristics controller and auxiliary equipment, system of railway electrification, trade remittance tractive effort, speed time curves, energy consumption, modern trends in electrical trades.

3. Heating and Welding:

Electric heating, resistance evens, temperature control, induction heating, principles and applications, high frequency induction heating, inductance furnaces by electric heating

4. Illumination:

Sources of light, incandescent & fluorescent lamps, lighting fittings, reflection factor, illumination, calculation, solid angle, candle power, units of light and illumination, power curves, M.H.C.P. AND M.S.C.P.

Illumination level and its measurement coefficient of utilization, waste light factor, illumination calculations for building and playgrounds, flood lighting, industrial lighting, street lighting

5. Electrolytic process and motor control circuit

3. POWER QUALITY & RELIABILITY (EE 8138)

Overview and definition of power quality (PQ) and reliability, Sources of pollution, international power quality standards, and regulations, Power quality problems: rapid voltage fluctuations, voltage unbalance, voltage dips and voltage swells, short duration outages

Power system harmonics: harmonic analysis, harmonic sources- the static converters, transformers magnetization and non- linearities, rotating machines, arc furnaces,

fluorescent lighting, Harmonic effects-within the power system, interference with communication Harmonic measurements. Harmonic elimination- harmonic filters. Power system reliability evaluation: Static generation capacity reliability evaluation, Operational generation capacity reliability evaluation, Inter connected power system reliability evaluation.

4. MECHATRONICS (EE 8139)

Mechatronics :

Definitions and terminology , its elements such as mechanics , electronics , microelectronics , power electronics and information technology. Mechanical elements with integrated electronics suspension systems , vibration dampers , clutches , bearing mechanical or magnetic , gears etc. Machines with integrated electronics , electric drives pneumatic and hydraulic drives , water steam or gas turbines , combustion engines , etc. Generators , pumps , compressors , machines tools , robots , printing machines , vehicles : automobiles , ships and aircrafts . Precision machines with integrated electronics devices for telecommunication , consumer electronics , data processing devices , sensors , actuators , optical devices and medical devices , power electronics converters.

5. HIGH VOLTAGE ENGINEERING (EE 8140)

Breakdown in gases :

Mechanisms of breakdown in gases, various related ionization processes. Townsends and streamer theories. Paschen's law, Breakdown in non-uniform fields. Effect of wave shape of impressed voltage on the breakdown strength. Breakdown of sphere gap and rod gap.

Breakdown in liquid and solids :

Mechanisms of breakdown in liquids, suspended particle, suspended water, cavitation and bubble and electronic breakdown theories. Mechanisms of breakdown in solids; intrinsic electro-mechanical, erosion, surface, thermal and streamer, relation between electric strength of solids and time, intrinsic breakdown strength.

Impulse Generator:

Specification of an impulse voltage wave, standard impulse, reasons for adopting the particular shape, analysis and control of simple circuit of impulse generator. Multistage impulse generator(marks circuit) circuit-working, earthing and tripping. Techniques to observe wave front on C.R.O.

Generation of high voltage :

Methods of generation of power frequency high voltage cascade transformers and resonance methods, generation of high voltage D.C., voltage stabilization. Tesla coil.

Measurement of high voltage :

Potential dividers-resistive, capacitive and mixed dividers for high voltage. Sphere gap; construction, mounting, effect of nearby earthed objects, humidity and atmospheric conditions, effect of irradiation and polarity, electrostatic voltmeter; principle and

classification, constructional details of an absolute electrostatic voltmeter. Oscilloscopes and their applications in high voltage measurement.

High Voltage Testing :

Measurement of insulation resistance of cables. Wet and dry flashover test of insulators. Testing of insulators in simulated polluted conditions. Testing of transformers and rotating machines. Measurement of breakdown strength of oil. Basic techniques of non-destructive testing of insulators; measurement of loss angle, high voltage Schering bridge, and partial discharge measurement techniques.

Over Voltage and Insulation Coordination :

Lighting, switching and temporary over voltages, BIL, SIL, Methods of insulation coordination.

6. INTELLIGENT INSTRUMENTATION (EE 8141)

Introduction, data flow and graphical programming techniques, virtual instrumentation (vi), advantages, vis and sub vis, data acquisition methods, DAQ hardware; structure, operating systems, ISA, PCI, USB, PCMCIA buses. IEEE 488.1 and IEEE 488.2, serial interfacing- RS 232C, RS 422, RS 423, CAMAC, VXI, SCXI, PXI, sensors and transducers; interfacing signal conditions, signal analysis technique, networking methods and their applications in instrumentation.

7. POWER ELECTRONICS APPLICATIONS IN POWER SYSTEM (EE 8142)

Basics of flexible ac transmission, controlled rectifier and energy storage, plants, tap changers and phase shifters, thyristors controlled VAR compensation and series compensation, modern (synchronous link converter) VAR compensators, unified power flow control (UPFC) and interline power flow controller, power quality conditioners, power electronics in power generation.

8. IDENTIFICATION TECHNIQUES AND ADAPTIVE CONTROL (EE 8143)

Review of stochastic process. Models & model classification. The identification problem, some fields of applications. Classical methods of identification of impulse response & transfer function models, model learning technique, linear least square estimator, properties of ISE, generalized & weighted least square, instrumental variable method. On the identification using recursive least squares, minimum variance algorithm, stochastic approximation & maximum likelihood method. Simultaneous state & parameter estimation extended Kalman filter, two stage identification methods. Nonlinear identification, model reference adaptive control.

9. POWER SYSTEM DYNAMICS AND CONTROL (EE 8144)

Introduction to power stability problems, models of: synchronous machines, excitation systems, prime mover & governor, loads. Transient stability analysis, dynamic stability analysis. Dynamic equivalents, stabilizers, levels of power system control, AGC, SCADA & computer control.

10. COMPUTER ORGANISATION & ARCHITECTURE (EE 8145)

Organization of a computer: von Neumann & Harvard architecture; instruction set architecture; RISC & CISC PROCESSORS, computer arithmetic; fixed point & floating point arithmetic; design of ALU; hardware algorithms for addition, multiplication & division of fixed point & floating point numbers, processor design; data path & control design, microprogramming, exception programming, pipelining, memory organization, memory hierarchy, cache organization, virtual memory, system design, bus architecture, bus transactions; input-output systems; programmed I/O, DMA & interrupt driven I/O. illustrations with examples of CISC processors from Intel & RISC processors like MIPS & ARM.

11. HVDC TRANSMISSION (EE 8146)

Comparison of HVAC & HVDC transmission, HVDC transmission schemes, component description, and converter: principles, characteristics, control circuits, HVDC system control, protection, harmonics & filters, AC-DC system interaction, AC-DC load flow.

12. INTELLIGENT ALGORITHMS FOR POWER SYSTEMS (EE 8147)

Introduction of artificial neural networks (ANN), multilayer feed forward networks, back propagation training algorithm, radial basis function & recurrent networks. ANN based algorithms for: load flow analysis, economic load dispatch, load forecasting, transient stability, & power system stabilizers. Introduction to genetic algorithms.

13. MODELING AND ANALYSIS OF ELECTRICAL MACHINES (EE 8148)

Energy state functions, modeling of electro mechanical systems. Matrix method & use of generalized circuit theory of machines. Different methods of transformation, phase variable instantaneous symmetrical component techniques, Development of basic performance equation & analysis of different rotating machines such as D.C., synchronous & induction machines, Dynamics & transients in electric machines. Switching transients & surges, Transient & short circuit studies on alternators, run-up re-switching & other transients in induction machines, relevant computer techniques for machine analysis. Modeling of special electrical machines

14. BIOMEDICAL INSTRUMENTATION (EE 8149)

Introduction to physiology of cardiac, nervous & muscular and respiratory systems. Transducers and Electrodes: Different types of transducers & their selection for biomedical application, Electrode theory, selection criteria of electrodes & different types of electrodes such as Hydrogen Calomel. Ag- AgCl. pH. etc.

Cardiovascular measurement: The heart & the other cardiovascular systems. Measurement of Blood pressure, Blood flow, Cardiac output and cardiac rate. Electrocardiography, phonocardiography, Ballistocardiography, Plethysmography, Magnet- cardiography, Cardiac pacemaker & computer applications.

Respiratory System Measurement: Respiratory Mechanism, Measurement of gas volumes & flow rate. Carbon dioxide and Oxygen concentration in inhaled air. Respiratory controllers.

Measurement of Electrical Activities in Muscles and Brain: Electroencephalograph, Electromyograph & their interpretation.

Instrumentation for clinical laboratory: Measurement of pH value of Blood ESR measurements, Haemoglobin measurements, Oxygen & carbon dioxide concentration in Blood, GSK measurements, polarographic measurements, Computer applications.

Medical Imaging: Ultra sound imaging Radiography & applications.

Biotelemetry: Transmission & reception aspects Biological signals. Aspects of patient cure monitoring.

15. NEURAL NETWORKS & FUZZY SYSTEM (EE 8150)

Introduction to artificial neural network

Neural Networks: History, overview of biological Neuro- system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning paradigms –Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms- perceptions, Training rules, Delta, Back propagation Algorithm, Multilayer perceptron Model, Applications of Artificial Neural Networks.

Competitive learning networks, Kohonen self organizing networks, Hebbian Learning; Hopfield Networks, Associative Memories, The boltzman machine; Applications.

Fuzzy Logic: Introduction to Fuzzy Logic, classical and Fuzzy Sets: Overview Of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations . Fuzzy Logic: Classical Logic.

16. VLSI DESIGN (EC 7111)

Analog VLSI circuit Design

- 1) Review of MOSEFT characteristics, scaling and small- geometry effects, MOSEFT capacitances.
- 2) MOS Resistor, MOS current source, current circuit. MOS voltage source linear voltage and current converters.
- 3) CMOS operational amplifier (OPAMP) design: Differential amplifier, level shifter, source follower, output stage voltage and power amplifiers. Cascade OPAMP. Compensation techniques.
- 4) Analog Filters: Switched capacitor (SC) fundamentals, First order SC circuits, second-order SC circuits and cascade design.
- 5) Analog to digital and digital to analog converters, speed of conversion and over sampling issues.
- 6) VSLI Interconnects: Distributed RC model, Transmission line model, Future inter connect technology.

Digital VLSI Circuit Design

- 1) MOS inverters, CMOS inverter, state characteristics, switching characteristics, power dissipation issues.
- 2) CMOS Logic gates: NAND, NOR, XOR, CMOS logic design of half and full adders. CMOS transmission gates, Pseudo-NMOS, domino logic gates.
- 3) Sequential MOS Logic Circuit: The SR latch circuit, Clocked latch and flip-flop, CMOS D-latch and edge – triggered circuits, Schmitt trigger circuit, Comparator.
- 4) Dynamic Logic Circuit: Pass transistor logic synchronous dynamic circuit techniques.
- 5) Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, Drivers and buffers, Buffer scaling and design issues.

CAD Tools for VLSI Design:

- 1) SPICE: Element lines, Control lines, Command lines, Types of analysis, models and model parameters, Sub circuit and Macros.
- 2) Layout design rules Layout of inverters, NAND, NOR gates using LASI

17. EMBEDDED SYSTEM DESIGN (EE 8151)

Embedded Computing: Introduction, Complex systems and Microprocessors, The embedded system design process, Formalization for system design.

Instruction Sets CPU: Instruction and preliminaries ARM and SHARC Processors, Programming I/O CPU performance and power consumption.

The embedded Computing Platform and program design: Introduction, the CPU bus, Component interfacing, designing in with microprocessors, development and debugging.

Program Design and Analysis: Introduction program design, Assembly, Linking, Basic compilation techniques, and Analysis optimization of executive time.

18. COMPUTER VISION (CS 7118)

Digital image fundamentals: elements of digital image processing system, elements of visual perception image model, digital image representation, basic relations between pixels, image geometry. Image model, digital image representation basic relations between pixels, image geometry. Image Transforms: Introduction to fourier transform, discrete fourier transform, fast fourier transform, other seperable image transforms. Image Enhancement: Spatial and Frequency – domain methods. Histogram-modification techniques, Image smoothing, Image sharpening by differentiation/high pass filtering. Image Restoration: Degradation model, algebraic approach to restoration, inverse filtering, LMS filter restorations, Interactive restoration, Restoration in spatial domain. Image Encoding: Fidelity of discontinuities, Edge linking and boundary detection, Thresholding, Representation and Description: Schemes, Boundary descriptors, Regional descriptors, Description of similarities, Relational descriptors. Image Data Compression: Introduction, Pixel coding, Predictive techniques, Transform coding theory, hybrid coding and vector DPCM.