

## 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, Bravais 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 – Rothery 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.

### **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.

### **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 Dequeues, strings, Application.

Linear Data Structures, Link Representation - 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.

### **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.

**PARATIAL 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.

## **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, trivector meter.

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.

## **COMMUNICATION SYSTEM & ENGG. (EC 4104)**

1. Wave spectra: Introduction, spectral analysis of respective waves.
2. Noise: Introduction, Thermal noise, S/N ratio, Equivalent Noise Resistance, Noise Factor, Noise Temperature.
3. Modulation and demodulation of signals:
  - (i) Amplitude Modulation, Frequency spectrum, Average power, Diode envelope detection.
  - (ii) SSB modulation, Principles, FET Balanced Modulators, SSB Generation by Phase shift method.
  - (iii) FM and PM: Frequency spectra, Equivalence between FM and PM, FET Reactance Modulator, The Armstrong method, FM stereo Broad Transmitter, Foster seely Discriminator, Pre-emphasis and De-emphasis. Automatic Frequency control.
4. Performance of Communication Systems. Noise in Amplitude Modulated systems and Angle modulated systems.
5. Super heterodyne Receivers (Block diagram treatment) choice of IF and Oscillator frequency, Image rejection.
6. Sampling Theorem, Pulse Modulation, Pulse Amplitude Modulation, Pulse Time Modulation, TDM, FDM.
7. Digital Communication: Pulse code modulation, Delta Modulation, Quantization Noise in Binary PCM, Digital carrier systems: ASK, FSK, PSK, and DPSK.
8. Introduction to Information theory, Measure of information channel capacity, exchange of BW for S/N ratio.

## **MICROPROCESSOR AND INTERFACING (EE 4107)**

Introduction to 8085A CPU architecture-register organization, addressing modes and their features. Software instruction set and Assembly Language Programming. Pin description and features.

Instruction cycle, machine cycle, Timing diagram.

Hardware Interfacing: Interfacing memory, peripheral chips (IO mapped IO & Memory mapped IO).

Interrupts and DMA.

Peripherals: 8279, 8255, 8251, 8253, 8237, 8259, A/D and D/A converters and interfacing of the same.

Typical applications of a microprocessor.

16 bit processors: 8086 and architecture, segmented memory has cycles, read/write cycle in min/max mode. Reset operation, wait state, Halt state, Hold state, Lock operation, interrupt processing. Addressing modes and their features. Software instruction set (including specific instructions like string instructions, repeat, segment override, lock prefizers and their use) and Assembly Language programming with the same.

Brief overview of some other microprocessors (eg. 6800 Microprocessor).

## **SEMESTER-V**

### **E.M.F (PH 5104)**

Gauss's Law, potential Functions Poission's and Laplaces 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.

### **TELECOMMUNICATION SWITCHING SYSTEMS & NETWORKS (EC 5105)**

Introduction:

Evolution of Telecommunication, Basics of Switching System, Classification of Switching System, limitation of Manual Switching System, Evolution of Automatic Switching System, Principle of Operation of Strangar & Crossbar Electromechanical Systems, pulse dialing & tone dialing-DTMF dialing, Signaling tones Circuit Switching & Packet Switching.

Electronic Switching:

Stored program control, centralized SPC, distributed SPC, software architecture, application software.

Traffic Engineering:

Blocking network, blocking probability, grade of service, traffic load, Parameters of traffic engineering, Erlang-B congestion formula.

Electronic space division switching

Time Division Switching:

Basic time division space switching, Basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, Frequency division switching,

Telephone Networks: (2-3 Stage Networks)

Subscriber loop systems, Switching hierarchy & routing, transmission systems, charging plan, signaling techniques-in channel & common channel signaling. Numbering Plan.

ISDN& ATM:

Introduction, ISDN channels & access arrangements, ISDN service capabilities, user-network interfaces, drawbacks of ISDN, introduction to B-ISDN. Introduction to ATM and cell transmission & AAL.

## **SEMICONDUCTOR DEVICES (EC 5106)**

CARRIER CONCENTRATIONS:

The Fermi level, Electron and Hole concentration at equilibrium, Direct and Indirect recombination of electrons and holes, Hall effect, Steady-state carrier generation, Quasi-Fermi levels.

TRANSPORT PHENOMENA:

Drift and Diffusion of Carriers, Recombination, Continuity and Diffusion equations, Hynes-Shockley experiment.

P-N JUNCTIONS:

The Contact Potential, Space Charge at a junction, Steady state condition, Current at a junction, Carrier injection, Junction breakdown, Time variation of stored charge, P-N junction capacitance, Graded junction.

JUNCTION DIODES:

Varactor Diode, Concept of negative resistance, Tunnel Diode, Current and Voltage in an illuminated junction, Photo Diode, Photo detector, Solar Cells, Light Emitting Diode, Metal Semiconductor Junction.

Principle of PIN photo detector and Avalanche photodiode, Noise in photo detectors, Detector response time, Photodiode materials.

Bipolar Junction Transistor (BJT):

Charge transport and current in a BJT, Current transfer ratio, Terminal currents, Generalised biasing, Charge control analysis, BJT switching, Turn-on and Turn-off transients, Base narrowing, Frequency limitations of a transistor.

FET, MOSFET:

Principle of Operation and I-V Characteristics of FET, MESFET, MOSFET, MOS Capacitor, Threshold voltage in MOSFET.

CCD & FABRICATION:

The basic CCD, Improved CCD p-n junction fabrication.

## **COMPUTER ORGANIZATION & ARCHITECTURE (CS 5106)**

Concepts & Terminology: Digital computer concepts; Von-Neumann concept ; Hardware & Software and their nature ; structure & functions of a computer system , Role of operating system.

Memory Unit : Memory classification , characteristics ; Organization of RAM , address decoding ROM/PROM/EEPROM ; Magnetic memories , recording formats & methods , Disk & tape units; Concept of memory map , memory hierarchy , Associative memory organization ; Cache introduction , techniques to reduce cache misses , concept of virtual memory & paging.

CPU Design: The ALU – ALU organization , Integer representation , 1s and 2s complement arithmetic ; Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address; Multiplication of signed binary numbers-Booth's algorithm ; Divide algorithms- Restoring & Non-Restoring ; Floating point number arithmetic; Overflow detection , status flags.

Instruction Set Architecture- Choice of instruction set ; Instruction word formats ; Addressing modes.

Control Design – Timing diagrams; T-States , Controlling arithmetic & logic instruction , control structures ; Hardwired & Micro programmed, CISC & RISC characteristics.

Pipelining - General concept , speed up , instruction & arithmetic pipeline; Examples of some pipeline in modern processors , pipeline hazards; Flynn's classification –SISD ,SIMD , MISD , MIMD architectures-Vector and Array processors & their comparison , Concept of Multiprocessor; Centralized & distributed architectures.

Input/output Organization : Introduction to Bus architecture , effect of bus widths , Programmed & Interrupt I/O , DMA.

## **LINEAR & DIGITAL CONTROL SYSTEMS (EE 5113)**

Introduction and types of feedback control system , Block diagram and signal flow graph analysis, 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.

Transform analysis of Sample data systems.  
Transform design of digital control.  
State space analysis of sampled data systems.  
Design of digital controls.

## **SEMESTER-VI**

### **INDUSTRIAL MANAGEMENT (ME 6123)**

Human Resource Management:

Recruitment and selection, Performance appraisal, Industrial Relations, Trade Union, Collective Bargaining

Organizational Behaviour:

Different Schools of Management Thought : Scientific Management, Administrative Theory, Theory of Bureaucracy, Human Relations Theory(Elton Mayo).

Motivation: Concept, Different Theories (Maslow, ERG, Herzberg, )

Communication: Purpose, process, Barriers to effective communication, Guidelines to make communication effective.

Perception: Process, Importance, Factors influencing perception, Shortcuts for judging people- Halo effect, Stereotyping, Projection.

Quality Management:

Concept, Dimensions for goods and services, Cost of Quality, Statistical Quality Control, Control Charts, Acceptance Sampling (single).

Total Quality Management: Concept, benefits, Criticism.

New Quality Tools: Kaizen, Six Sigma, Quality Circles.

Productions Management:

Concept. Difference from Operations Management, Types of Production( Mass, Batch, Project), Functions of Production Management.

Productivity: Concept, Different Inputs and Productivity Measures, Efficiency and Effectiveness, Measures to increase Productivity.

Marketing Management:

Basic Concepts of Marketing, Difference between Selling and Marketing, Elements of Marketing Mix- the 4 P's.

Marketing Environment: Mega Environment, Micro Environment, Internal Environment, Relevant Environment.

Simple Marketing Strategies: SWOT Analysis, BCG Matrix, Industry Matrix.

Materials Management:

Concept, Functions, EOQ Models- Wilson model, model with shortage, model with quantity discount, model without shortage , Selective Inventory Control—ABC, VED, FSN analysis.

## **ANTENNA ENGINEERING (EC 6107)**

Antenna fundamental and radiation mechanism

Vector potential concept, Gain, Effective aperture

Wire antenna, Loop antenna

Aperture antenna

Reflector antenna, Cassegrain antenna, Gregorian antenna

Planar antenna

Lens antenna

Broadband antenna

Frequency independent antenna

Antenna synthesis

Near field – Far field transformation

Antenna arrays, Grating lobes

Antenna for mobile communication

Antenna measurements: Radiation pattern, Gain and Radiation impedance.

## **MICROWAVE ENGINEERING (EC 6108)**

Introduction –

RF and microwave spectrum, historical background, application of RF and microwave.

Microwave Impedance Matching –

Unknown impedance measurement using shift in minima technique and impedance matching using single and double stub matching

Microwave waveguides and components –

Rectangular waveguide and circular waveguide – mode structure, cutoff frequency, wall current, attenuation; microwave cavities – rectangular cavity resonator, Q factor, power divider, scattering matrix and transmission matrix, attenuator, phase shifter, directional coupler, Bethe hole coupler, magic tee, hybrid ring, circulator, isolator, Ferrite Devices.

Planar structures –

Strip line, microstrip line, coplanar structure

Microwave Tubes –  
 Limitations of conventional tubes, Multicavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube, Backward Wave Oscillator  
 Semiconductor Microwave Devices –  
 Tunnel diode, Gunn diode and their waveguide mounts, Avalanche diodes – IMPATT, TRAPATT, Microwave bipolar transistor, heterojunction bipolar transistor, Microwave field effect transistor – JFET, MOSFET, MESFET  
 Applications of microwave –  
 Industrial Applications of microwave  
 Microwave Measurement –  
 VSWR measurement, power measurement, impedance measurement, frequency measurement

Equivalent RF circuit parameters  
 Low pass filter, high pass filter, band pass filter, RF amplifier

## **DIGITAL COMMUNICATION SYSTEM (EC 6109)**

1. Introduction  
 A historical perspective in the development of digital communication. Elements of digital communication system.
2. Source encoding  
 Pulse code modulation, quantization noise, linear and non linear quantization, companding. Differential pulse code modulation, delta modulation, adaptive delta modulation, Delta sigma modulation, linear predictive coders.
3. Multiplexing:  
 Introduction to different type of multiplexing, Frequency Division & Time Division Multiplexing: multiplexing hierarchy, synchronous and asynchronous multiplexing, pulse stuffing and word stuffing.
4. Baseband transmission  
 Baseband signal receiver: integrate and dump type filter probability of error calculations, optimum filters, coherent reception, matched filter and its transfer function. Probability of error of matched filter.  
 Regenerative repeater, Bit synchronization, Inphase and midphase synchronizer. Early late gate synchronizer. Frame synchronization.
5. Different type of line coding – UPNRZ, UPRZ, PNRZ, PRZ, Manchester, differential encoding and their spectral characteristic, self synchronization properties of some of the encoded signal..
6. Equalization  
 Inter symbol interference (ISI), Purpose of equalization, Eye pattern, Nyquist criterion for zero ISI, fixed equalizer. Design of equalizer, Adaptive equalizer, Decision directed equalizer, Adaptive decision directed equalizer, Partial response signaling.
7. Digital modulation techniques  
 BPSK, DPSK. BFSK, MARY-PSK & -FSK, QPSK, MSK principles, QASK, Error calculation.

9. Spread-spectrum modulation  
Pseudo-Noise Sequence, A notion of Spread Spectrum, Direct-Sequence Spread-Spectrum with Coherent Binary Phase-Shift Keying, Processing Gain, Probability of Error, Frequency-hop Spread Spectrum, Code-Division Multiple Access.
10. Information theory and coding  
Concept and measure of information, Entropy, Discrete and continuous messages, Message source, zero memory source, extension of zero memory source, Markov source and their entropy, Channel with and without memory, Channel capacity, Hartley and Shannon's law.  
Properties of code: Uniquely decodable codes, Instantaneous codes, Kraft inequality and Macmillian inequality, Construction of instantaneous codes, Hoffman and Shannon – Fano coding.

## **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.

## **SEMESTER-VII**

### **DIGITAL SIGNAL PROCESSING (EC 7110)**

Introduction, Overview of digital signal processing.

Discrete – Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system. Classifications of sequence, recursive and non-recursive system.

Mathematical operations on sequences: Convolution, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems, MATLAB examples (Tutorial)

Z-transform: Definition, relation between Z transform and Fourier transform of a sequence, properties of Z transform, mapping between S-plane and Z-plane. Unit circle, convergence and ROC, Inverse z-transform, solution of difference equation using the one sided Z-transform MATLAB examples (Tutorial).

Discrete Fourier transform: Definition, inverse discrete Fourier transform (IDFT) Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, Fast Fourier transform (FFT), FFT algorithm, Radix 2 algorithm. Decimation-in-time and decimation-in- frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm, MATLAB examples (Tutorial).

Digital filter realization: Principle of digital filter realization, structures of All-zero filters. Design of FIR (Finite impulse response) filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman. Design of infinite impulse response filters (IIR) from analog filters. Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimisation method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples (Tutorial).

### **VLSI DESIGN (EC 7111)**

Analog VLSI Circuit Design: -

- i) Review of MOSFET characteristics, scaling and small-geometry effects, MOSFET capacitances.
- ii) MOS resistor, MOS current source, current mirror circuits. MOS voltage source Linear voltage and current converters.
- iii) CMOS operational amplifier (OPAMP) design: - Differential amplifier, level shifter, source follower, output stage voltage and power amplifiers. Cascode OPAMP. Compensation techniques.
- iv) Analog Filters: - Switched capacitor (SC) fundamentals, first order SC circuits, second-order SC circuits and cascade design.
- v) Analog to digital and digital to analog converters, speed of conversion and over sampling issues.

vi) VLSI Interconnects: - distributed RC model, transmission line model. Future inter connect technologies.

Digital VLSI Circuit Design: -

i) MOS inverters, CMOS inverter, state characteristics, switching characteristics, power dissipation issues.

ii) CMOS logic gates: NAND, NOR, XOR, CMOS logic design of half and full adders. CMOS transmission gates, pseudo-nMOS, domino logic gates.

iii) Sequential MOS Logic Circuits: The SR latch circuit, clocked latch and flip-flop, CMOS D-latch and edge-triggered circuits, Schmitt trigger circuit, Comparator.

iv) Dynamic Logic Circuits: Pass transistor logic, synchronous dynamic circuit techniques.

v) Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, drivers and buffers, Buffer scaling and design issues.

## **SYSTEM PROGRAMMING & OPERATING SYSTEMS (CS 7117)**

Assemblers: - Elements of Assembly Language Programming; Pass Structure of Assemblers; Two Pass Assembler

Compilers and Interpreters: - Aspect of Compilation; Memory Allocation; Compilation of Expressions; Compilation of Control Structures; Code Optimization; Interpreters.

Linkers: - Relocation and Linking Concepts; Design of A Linker; Self-Relocating Programs.

Software Tools: - Editors; Debuggers.

Introduction to Operating Systems: - OS Functions; Evolution of OS Functions; Batch Processing Systems; Multiprogramming Systems; Time Sharing Systems.

Scheduling: - Scheduling Policies; Job Scheduling; Process Scheduling; Process Management in UNIX.

Deadlocks: - Definitions; Resource Status Modeling; Handling Deadlocks; Deadlock Detection and Resolution; Deadlock Avoidance.

Process Synchronization: - Process Definition; Process Control; Implementing Control Synchronization; Classical Problems; Semaphores.

Memory Management: - Preliminaries; Contiguous Memory Allocation; Noncontiguous Memory Allocation; Virtual Memory Using Paging; Virtual Memory Using Segmentation

I/O Organization: - IO Organization; IO Devices; file Organizations; Directory Structures; File Sharing.

Protection and Security: - Encryption of Data; Protection and Security

Mechanisms; Protection of User Files.

Distributed Operating Systems: - Definitions and Examples; Design Issues in Distributed Operating Systems.

## **ELECTIVE I & II**

### **DATABASE MANAGEMENT SYSTEMS (CS 5104)**

#### Introduction

File & Data Base Concept , Overview of DBMS, Data Models, Database Administrator, Database Users, Schema. Data Independence

#### Entity-Relationship Model

Basic concepts , Keys, Entity-Relationship Diagram, Cardinality ratios, Strong & Weak Entity Sets, Specialization, Generalization, Aggregation.

#### Relational Model

Procedural & Non Procedural Languages, Relational Algebra, Extended Relational Algebra Operations, Views, Modifications Of the Database, Relational Calculus .

#### SQL

Basic Concepts, Set operations, Aggregate Functions, Null Values, assertions, views, Nested Sub-queries, Cursors, Stored procedures and triggers.

#### Integrity Constraints & Introduction to RDBMS

Domain Constraints, Referential Integrity Constraints, Codd's rule.

#### Functional Dependencies and Normalization

Functional Dependency, Armstrong's axioms, Canonical Cover, Closure , Full and Partial Functional dependencies, Prime & Non Prime attribute , 1NF, 2NF, 3NF, BCNF, Multi valued Dependency , 4NF, 5NF, DKNF .

#### Transaction & Concurrency Control

Transaction concept, ACID properties, Conflict & View serializability, Test for Conflict serializability, Concurrency Control, Lock base protocols, Two phase locking.

#### Storage Strategies

Single-Level Index (primary, secondary, clustering), Multi-level Indexes, Dynamic Multi-level Indexes, Hashing Techniques, B tree and B+ tree .

#### Query Optimization

Full Table scan, Indexed-based scan, Merge join, Nested loop join , Equivalence rules , Heuristic Optimization , Cost Based Optimization.

## Backup & Recovery

Physical & Logical Backup , Transaction logs, Causes of failures , Recovery techniques.

## Distributed Databases

Basic Concepts, Data Fragmentation, Replication and Allocation Techniques, Types of Distributed Database Systems, Query Processing, Overview of Client-Server Architecture and Its relationship to Distributed Databases.

## **COMPUTER VISION (CS 7118)**

Discrete geometry & quantization

Length estimations

Automated visual inspection

Object recognition & matching

Depth perception problems

Stereo geometry & correspondence

Motion analysis

Optical flow

Application of computer vision

Remote sensing

Bio-medical imaging

Document processing

Target tracking

## **MULTIMEDIA ENGINEERING (IT 7107)**

Introduction to Multimedia: Concepts, uses of multimedia, hypertext and hypermedia.; Image, video and audio standards.

Audio: digital audio, MIDI, processing sound, sampling, compression.

Video: MPEG compression standards, compression through spatial and temporal redundancy, inter-frame and intra-frame compression .

Animation: types, techniques, key frame animation, utility, morphing.

Virtual Reality concepts.

Windows concepts and terminology, key elements Creating the look, communication via messages, windows resources and functions, adding multimedia and sound resources. Writing windows applications, taking control of windows, adding menus, dialog boxes, Special controls.

## **WEB TECHNOLOGY (CS 7112)**

### Static Web Pages

Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWW-Basic concepts, web client and web server, http protocol (frame format), universal resource locator (url), HTML- different tags, sections, image & pictures, listings, tables, frame, frameset, form.

### Dynamic Web Pages

The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation.

### Active Web Pages

Need of active web pages; java applet life cycle.

### Java Script

Data types, variables, operators, conditional statements, array object, date object, string object.

### Java Servlet

Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.

### JSP

JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.

### J2EE

An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI.

### XML

Extensible Markup Language (XML), basics of XML, elements and attributes, document type definition, XML parsers, sequential and tree approach.

## **WIRELESS COMMUNICATION (EC 7112)**

Introduction to Wireless Communication Systems – evolution of mobile radio communications, mobile radio systems around the world, radio communication systems – paging systems, cordless telephone systems, cellular telephone systems; comparison of common wireless communications, trends in cellular radio and personal communication, second generation (2G) cellular networks, third generation (3G) wireless networks, introduction to radio wave propagation, free space propagation model

Basics of mobile communication – Limitations of conventional mobile system, mobile cellular communication – introduction, concept of frequency reuse, cluster size, cellular system architecture – mobile station, base station, MSC, channel assignment strategies, call handover strategies, interference and system capacity, improving capacity in cellular systems – cell splitting, sectoring, repeaters, microcell zone concept.

Global system for mobile communication – GSM services and features, system architecture, GSM radio subsystem, GSM channel types, location updating and call setup, introduction to CDMA digital cellular standard, comparison between GSM and CDMA.

Wireless networking – wireless local area network standards, technology – RF and IR wireless LAN, diffuse, quasi-diffuse and point-to-point IR wireless LAN, advantages and applications of Wireless LAN, introduction to WI-FI, Bluetooth, 3G and 4G wireless systems

## **ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM (CS 7111)**

Introduction :Overview of AI, Problems of AI, AI techniques; Problem Solving - Problem space and search, Defining the problem as state space search, Problem characteristics; Tic-Tac-Toe problem.

AI languages Basic knowledge of programming languages like Prolog and Lisp.

Basic Search Techniques :Solving problems by searching; Uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing search strategies in terms of complexity.

Special Search Techniques : Heuristic Search- greedy best-first search, A\* search; Hill climbing search, Simulated annealing search; Genetic algorithms; Constraint satisfaction problems; Adversarial search - Games, Optimal decisions and strategies in games, Minimax search, Alpha-beta pruning.

Symbolic Logic :Syntax and semantics for propositional logic, Syntax and semantics of FOPL, Properties of WFF, Clausal form, Unification, Resolution.

Reasoning Under Inconsistencies and Uncertainties :Non-monotonic reasoning, Truth maintenance systems, Default reasoning & closed world assumption, Predicate completion and circumscription, Fuzzy logic.

Probabilistic Reasoning :Bayesian probabilistic inference, Representation of knowledge in uncertain domain, Semantics of Bayesian networks, Dempster-Shafer theory.

Structured Knowledge :Associative networks, Conceptual graphs, Frame structures.

Expert Systems :Rule based systems, Nonproduction systems: decision tree architectures, blackboard system architectures, neural network architectures.

Learning :Types of learning, general learning model, Learning by induction: generalization, specialization; example of inductive learner.

## **REAL TIME & EMBEDDED SYSTEM (EC 7113)**

Introduction-defining Real time systems,Embedded Real Time Systems,Special

Characteristics of real time systems,a brief evolutionary history.

Hardware Architectures of Real Time systems.

Software architectures(concepts of interrupt driven activation,need for real time monitor,pseudo parallelism),meeting of dead lines & real time constraints.

Overview of WARD & MELLOR Methodology: Ward & Mellor Life Cycle,the essential model step,the implementation model,real time extensions of DFD

Real time languages: overview of ADA/Java Extension

Real time Operating Systems .

System Development Methodologies.

## **ROBOTICS (EC 7114)**

Robot Anatomy Arm Geometry-Direct & Inverse Kinematics Problem.Arm Dynamics,D'Alembert Equations of Motion, Synthesis of elements with mobility constraints,manipulations-trajectory planning,joint interpolated trajectories.

Control of Robot Manipulation-computed torque technique sequencing & adaptive control, resolved motion control Moulie Robots.

Robot sensing-Range & Proximity & Higher-Level vision, illumination techniques,Imaging Geometry, Segmentation Recognition & Interpretation.

Robot Programming Language Characteristics of Robot Level & Task Level languages.Robot intelligence-State Space search, Robot learning,Robot Task Planning,Knowledge Engineering.

## MODELING & SIMULATION(CS 7113)

The notion of system, model, simulation. Types of simulations. Illustrative examples. Conceptual and computer models. Verification and validation of models. Simulation experiment. Simulation project life cycle. Description of simulation models. Structure vs. behaviour models. Classification of tasks solved within the modelling and simulation process.

Detailed example introduction: database server as a typical queuing system. Description of discrete-event systems behaviour. Modelling of time. The notion of status, event, activity, process and their interdependencies. Object-oriented model design. Simulation time, control of time advancement, event list. Event driven simulation algorithm. Detailed example: implementation of the database server as a queuing system.

Random numbers in simulation. Random variables with discrete and continuous probability distribution. Pseudo-random generators. Multiplicative and additive congruential method. Nonuniform random numbers.

Testing of pseudo-random generators. Monte Carlo method. Precision. Queueing systems. Entities: queues, service facilities, storages. Properties of input and output stream. Kendall classification of queueing systems. Entity behaviour and statistical data sampling during the simulation run.

Discrete and continuous Markov model. Birth -Death processes.

Steady-state queueing systems of types  $M/M/1$ ,  $M/M/\infty$ ,  $M/M/m$ ,  $M/Er/1$ ,  $Er/M/1$  and their variants.

Models  $M/G/1$ ,  $G/M/1$ ,  $G/M/m$ ,  $G/G/1$ ,  $G/D/1$ ,  $M+D/D/1$ . Closed systems and queueing networks. Simulation languages for discrete-event systems. Case study and comparison: Simscript, GPSS, SOL,

Case study and comparison: Simula 67. Object oriented design and implementation of simulation models. Persistence of objects in C++, case studies. Application in a simulation system. Simulation experiments. Preparation and pre-processing of input data. Statistical data collected during the simulation run. Time dependency of statistics. Histograms. Evaluation and interpretation of results. Model validation and verification.

Simulation of digital systems. Abstractions levels of digital system description. Models of signals and functions. Structure vs. behaviour. Models of components. Models of delays.

Digital systems simulators - methods of implementation. Flow of simulation time. Synchronous and asynchronous algorithm of digital systems simulation. Acceleration of simulation run.

Register-transfer level simulation. Simulation languages of HDL type. VHDL language and tools. Implementation of concurrent statements and processes in VHDL. Modelling of time and event list.

## **SEMESTER-VIII**

### **OPTICAL FIBRE COMMUNICATION (EC 8118)**

Introduction to optical fiber communication – principles and systems  
Different types of fibers, SMF & MMF, Ray Theory analysis for step index fiber only.

Fiber optic transmitters using LEDs and Laser diodes, Bias stabilization of LEDs and Lasers, Driver circuits for analog and digital modulation, Temperature stabilization of laser diodes, Modulation bandwidths of lasers and LEDs

Fiber optic receivers using PIN and APD photodiodes, photo-diode amplifiers, SNR in PIN and APD receivers, Receiver sensitivity, Eye diagram

Coupling mechanisms of optical power from source to fiber and fiber to photodetector, Transmission characteristics of fibers and their effects on system performance, Selection of optical fiber types for short-haul, long-haul and high speed data links, optical power budget calculations of a fiber optic communication link

Fiber optic interconnectivity devices for fiber optic communication links and networks :

Optical isolators, polarizers, circulators, attenuators, Bragg grating filters, add/drop multiplexers, WDM MUX / DEMUX, fiber amplifiers, guided wave devices as external optical modulators

Fiber optic analog modulation methods, Sub-carrier multiplexed analog communication principles, IM-DD systems, Fundamentals of optical coherent detection, Optical pulse format for digital communication systems, Performance of a 10 Mb/s digital fiber optic link and a 10 Gb/s data link, Effects of chirp and linewidths of lasers on system performance

Fiber optic networks for LAN, MAN and WAN – a brief study

### **POWER ELECTRONICS (EE 8152)**

#### **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.

## **ELECTIVES III, IV & V**

### **INTERNET TECHNOLOGY (IT 7108)**

#### An Overview on Internet

The need for an Internet, The TCP/IP Internet, Internet services, Internet protocols and standardization, Review of Network technologies.

#### Internetworking Concepts

Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

#### Internet Address

Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing.

#### Internet Protocol

Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

#### Routing

The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

#### Enterprise Networking

Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.

#### Internet Servers

DNS, DHCP Servers, FTP, TELNET, E-Mail

#### Firewall & Networking

Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

## **SOFTWARE ENGINEERING (CS 4102)**

### Software Quality

Software Quality Assurance, Software Metrics, Software Validation, Static and Dynamic Analysis, Symbolic Equation, Mutation Analysis, Dynamic Testing, Unit Testing, White-box and Black-box Testing, Test Case Generation, Integration Testing, Bottom-up and Top-down Testing, System Testing, Function Testing, Performance Testing, Acceptance Testing, Installation Testing, Theoretical Foundation of Testing, Formal Verification, Test tools.

### User Interface

Module Introduction, Objectives of Usability, How to Approach Usability, Designing with Usability in mind, Measuring Usability, Guidelines for User Interface Design, User Interface Elements, Dialog Design, SSADM, Methodology for Dialog Design, Prototyping Tools.

### Software Reliability

Reliability, Hazard, MTTF, Repair and Availability, Steady-State Availability, Estimation of Residual Errors, Reliability Models, Software Complexity, Cyclomatic Complexity, Halstead's Metrics.

### Project Management

Issues in Project Management, Management Functions, Software Project Management Plan, Software Management Structure, Personnel Productivity, Software Project Complexity, Software Metrics – Basic Consideration, Size Oriented and Function Point Oriented; Software Cost Estimation Techniques, Algorithmic Cost Modeling, The COCOMO Model, Project Scheduling, Software Project Planning, Scheduling Risk Management.

## **DIGITAL IMAGE PROCESSING (EC 7115)**

Digital image fundamentals: - Image digitization

Sampling & quantisation

Image resolution

Colour perception & processing

Image processing: - Pixel based transformation

Geometric transformation

Local processing: - Edge detection, subpixel location estimation

Restoration: - Degradation, inverse fitting, Wiener filtering

Binary image processing: - Thresholding, run length encoding

Distance transforms, Medial axis transforms

Morphological operations

Region segmentation & Representation: - Split & merge algorithm

Region growing

Image filtering: - Histogram modification

Linear & Gaussian filters

Contours: - Digital curves

Poly line splitting

Hop along algorithm

Conic & Splines Hough transform

Fourier description

Textures: - Statistical syntactic & model based methods

Image transforms: - Fourier, Hadamard, Discrete Cosine

Wavelets & other orthogonal transforms

Compression of image: - Predictive compression methods, vector quantisation, hierarchical & progressive methods, JPEG, MPEG

Case studies

## **SOFT COMPUTING (CS 6109)**

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

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.

Genetic algorithms (GA), Evolutionary strategies (ES), Evolutionary programming (EP), Genetic Programming (GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models.

Other Soft computing approaches

Simulated Annealing, Tabu Search, Ant colony based optimisation, etc.

## **MOBILE COMMUNICATION (EC 8119)**

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signalling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signalling.

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

Server-side programming in Java, Pervasive web application architecture, Device independent example application

## **CRYPTOGRAPHY (EC 8120)**

Introduction : Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification.

Methods of Data Compression : Data compression-- Lossless & Lossy; Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding—Predictive coding, Differential pulse code modulation, Delta modulation, Adaptive differential pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression.

Introduction To Security : Need for security, Security approaches, Principles of security, Types of attacks.  
Cryptographic Techniques : Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.  
Symmetric & Assymmetric Key Cryptography : Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Assymmetric key together, Digital signature, Knapsack algorithm.  
User Authenticcation Mechanism : Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall .  
Case Studies Of Cryptography : Deniel of service attacks, IP spoofing attacks, Secure inter branch payment transactions.

## **BIOMEDICAL ELECTRONICS (EC 8121)**

Origin of bio-potential:

- Electric activity of excitable cells, resting potential, action potential, Nerst equation, propagation of action potential.
- Surface map of bio-potential- concept.

Biomedical electrodes:

- Electrode theory.
- Working principle & application of different bio-potential electrodes & biochemical transducers-
  - Microelectrodes, surface electrodes, needle electrodes
  - Reference electrode, pH electrode, blood gas electrode
  - Ion electrode.

Cardiovascular measurements:

- Brief description of cardiovascular system.
- Electrocardiography-
  - Sources of cardiac bio-potentials,
  - Methodology & principle of measurement
  - Electrocardiograms & their inferences
- Vector cardiography- concept
- Principles of direct & indirect measurement of blood pressure
- Principles of measurement of blood flow/cardiac rate
- PH & blood gas analyzer

Electroencephalography (EEG):

- Sources of action potentials
- Methodology & principle of measurement
- Electroencephalograms & their inferences

Electromyography:

- Sources of action potentials
- Methodology & principle of measurement
- Electromyograms & their inferences

Respiratory system measurement:

- Respiratory mechanism, parameters of respiratory system
- Principle of measurement of various parameters, impedance pneumograph, Spirometer.

Medical imaging systems:

- Working principles of medical X-ray, CT scan, CAT scan, Ultrasound scanning, MRI

Therapeutic & prosthetic devices:

Pacemakers, Defibrillators, ventilators, respirators, hemodialysis machine

Medical application of LASER including safety aspects

Fiber optic application in imaging internal organs

Effect of mm wave and microwave on human body

Electrical safety:

Physiological effect of electricity, micro shock & macro shock hazards, electrical safety standards for human body, basic approaches to shock protection.

## **SATELLITE COMMUNICATIONS(EC 8122)**

Introduction to satellite communication – brief history and overview of satellite communication

Orbital mechanics and launchers – equations of the orbit, orbital elements, look angles, sub-satellite points, satellite launching and launch vehicles

Satellite description – communication subsystem, telemetry, command and ranging subsystem, attitude control subsystem, electrical power subsystem

Satellite transponder – Transponder model, channelisation, frequency plan, processing

Satellite link design – basic transmission theory, system noise temperature and G/T ratio for earth stations, design of uplink and downlink, atmospheric and ionospheric effects on satellite link

Earth station – description, earth station antenna, low noise amplifier, up converter, down converter, monitoring and control, VSAT

## **VALUES & ETHICS OF PROFESSION (IT 6105)**

Science, Technology and Engineering as knowledge and as Social and Professional Activities

Effects of Technological Growth:

Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources

Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics

Appropriate Technology Movement of Schumacher; later developments

Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession:

Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Profession and Human Values:

Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

## **ENTERPRISE RESOURCE PLANNING (EC 8124)**

1. Electronic Commerce : Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations For Controlling E – Commerce, Cyber Laws.
2. Technologies : Relationship Between E – Commerce & Networking, Different Types of Networking For  
E – Commerce, Internet, Intranet & Extranet, EDI Systems  
  
Wireless Application Protocol : Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce .
3. Business Models of e – commerce : Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance.
4. E – strategy : Overview, Strategic Methods for developing E – commerce.

5. Four C's : ( Convergence, Collaborative Computing, Content Management & Call Center ).

Convergence : Technological Advances in Convergence – Types, Convergence and its implications, Convergence & Electronic Commerce.

Collaborative Computing : Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security.

Content Management : Definition of content, Authoring Tools & Content Management, Content – partnership, repositories, convergence, providers, Web Traffic & Traffic Management ; Content Marketing.

Call Center : Definition, Need, Tasks Handled, Mode of Operation, Equipment , Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).

6. Supply Chain Management : E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE - Framework, Internet's effect on Supply Chain Power.
7. E – Payment Mechanism : Payment through card system, E – Cheque, E – Cash, E – Payment Threats & Protections.
8. E – Marketing :. Home –shopping, E-Marketing, Tele-marketing
9. Electronic Data Interchange (EDI) : Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI FACT / GTDI, ANSI X – 12), Data Encryption (DES / RSA).
10. Risk of E – Commerce : Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.
11. Enterprise Resource Planning (ERP) : Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign, Knowledge engineering and data warehouse .

Business Modules: Finance, Manufacturing (Production), Human Resources, Plant Maintenance,

Materials Management, Quality Management, Sales&Distribution  
ERP Package,

ERP Market: ERP Market Place, SAP AG, PeopleSoft, BAAN, JD Edwards,  
Oracle Corporation

ERP-Present and Future: Enterprise Application Integration (EAI), ERP and E-Commerce, ERP and Internet, Future Directions in ERP