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 lover 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.

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, Btrees,

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, EBDIC, 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

PRINCIPLE OF PROGRAMMING LANGUAGES (IT 3102)

Concepts of structural program development; concept of data types; precedence and associativity of operators; conditional transfer; deterministic and in-deterministic loops;

Recursions; functions and procedures - call by value, call by reference and their differences; programming for numerical methods; records.

Data-type handling and various constructs (conditional, loop, functions etc); pointers: concept of pointers and passing parameters using pointers, non-numeric processing, concept of arrays of pointers and pointers to pointers;

Structures and unions – advantage of using structures, concept of information hiding, pointers to structures; files - basic concept of various types of file access methods: sequential, indexed sequential, random, various statements for file handling

Advanced Programming Languages like C++, ADA, LISP, PROLOG, and PASCAL.Comparison of various languages

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, Hyper geometric, 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 structuer of

Op-amp, C onstant 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.

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.

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 serializabilty, Test for Conflict
serializability, Concurrency Control, Lock base protocols, Two phase locking.

Storage Strategies
Single-Level Index (primary, secondary, clustering), Multi-level Indexes, Dynamic
Multilevel
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.

OBJECT ORIENTED PROGRAMMING IN JAVA

Object oriented programming:-
Introduction, basic of OOPS, Fundamentals characteristics of OOPS, Benefits of OOPS

Introduction to Java:-
Introduction, History of java, The JVM (Java Virtual Machine)

Java fundamentals:-

Type of java program, Application programs, Applets, Servlets, Java Architecture, JDK Tool's and API.

Java Programming:-
Building the first Java Program, Compiling and running first java program, comments in a program commands and arguments, interactive inputs.

Data Type, Variables and Operators.

Control Statement and Looping Structures:-
Introduction, Input and output statements, control flow statements, decision making statements, swing, break, continue, return, type casting.

Classes and objects:-
What are classes, declaring a class rules for naming classes, creating an object methods, operator constructors, types f constructor, the final modifier.

Exploring methods& inheritance:-
Arguments passing, call by value, characteristics of call by value, call by reference, introduction of inheritance, subclasses, overring, types of inheritance, inheritance using abstract classes.

Packages and interface:-
Structure of java program, how to create a package, what are packages, what are nested package, creating an interface, using interface-extending interface, exhibiting multiple inheritance through interface.

String, Arrays and vector:-
Introduction to string, substring, usage of various string functing, what is an array, initialization of a array type of array vector,

Exception handling:-
Syntax for exception handling, the try block, the catch block, the finally block, exception types, throw, throws, use of defined exception.

Multithreading
Multitasking and multithreading, parallelism, thread, runnable, synchronized, characteristic of thread.

Applet:-
All about applet, without using HTML file to run an applet, the APPLET tag, paint(), update().

Graphics:-
Introduction to graphics, drawing lines, drawing rectangles, drawing ovals, drawing arcs, drawing polylines.

SEMESTER-V

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).

OPERATING SYSTEMS (CS 5103)

Introduction
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure
Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management
Processes: Concept of processes, process scheduling, operations on processes, cooperating processes, inter-process communication.
Threads: overview, benefits of threads, user and kernel threads.
CPU scheduling: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, and priority), algorithm evaluation, multi-processor scheduling.
Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.
Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management
Memory Management: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.
Virtual Memory: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.
I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management:disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk formatting, boot block, bad blocks.

Protection & Security
Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

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.

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.

FORMAL LANGUAGES & AUTOMATA THEORY(CS 5107)

Finite State Machines
Definition, concept of sequential circuits, state table & state assignments, concept of synchronous, asynchronous and liner sequential machines

Finite State Models
Basic definition, mathematical representation, Moore versus Mealy m/c, capability & limitations of FSM, state equivalence & minimization, machine equivalence, incompletely specified machines, merger graph & compatibility graph, merger table, Finite memory, definite, information lossless & inverse machines : testing table & testing graph.

Structure of Sequential Machines
Concept of partitions, closed partitions, lattice of closed partitions, decomposition : serial & parallel.

Finite Automation
Preliminaries (strings, alphabets & languages, graphs & trees, set & relations), definition, recognition of a language by an automata - idea of grammar, DFA, NFA, equivalence of DFA

and NFA, NFA with e-moves, regular sets & regular expressions: equivalence with finite automata, NFA from regular expressions, regular expressions from DFA, two way finite automata equivalence with one way, equivalence of Moore & Mealy machines, applications of finite automata.

Closure Properties of Regular Sets
Pumping lemma & its application, closure properties minimization of finite automata : minimization by distinguishable pair, myhill-nerode theorem.

Context Free Grammars
Introduction, definition, derivation trees, simplification, CNF & GNF.

Pushdown Automata
Definition, moves, instantaneous descriptions, language recognised by PDA, deterministic PDA, acceptance by final state & empty stack, equivalence of PDA and CFL.

Closure Properties of CFLs
Pumping lemma & its applications, ogden's lemma, closure properties, decision algorithms.

Introduction to ZRL & CSL
Introduction to Z. Regular language properties and their grammars, Context sensitive languages

SEMESTER-VI

DESIGN & ANALYSIS OF ALGORITHMS (CS 5105)

Models of computation: Random Access Machine, Relationship between Turing Machine and RAM, Time and Space Complexity.

Complexity analysis: Asymptotic notations, Recurrence for divide and conquer and its solution, Merge sort, Heap sort, Quick sort and their complexity.

Dynamic Programming: Basic method, Matrix-chain multiplication, all pair shortest paths, Single-source shortest path, Travelling Salesman problem.

Greedy Method: Basic method, Knapsack problem, Job sequencing with deadlines, Minimum spanning tree by Prim's and Kruskal's algorithms.

Disjoint Set Manipulation: Set manipulation algorithm like UNION-FIND, Union by rank, Path compression.

Graph Traversal Algorithms: BFS and DFS, Backtracking and its use in solving Knapsack and Eight queens problem.

Matrix Manipulation Algorithms: Strassen's Matrix-multiplication algorithm and its applications in Solution of simultaneous linear equations using LUP decomposition, Inversion of Matrix and Boolean Matrix multiplication.

Notion of NP-completeness: P class, NP-hard class, NP-complete class, Circuit Satisfiability problem.

Approximation Algorithms: Vertex cover problem, Travelling salesman problem, Set covering problem.

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 (Gas),Evolution strategies(Ess),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.

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.

FINANCIAL MANAGEMENT & ACCOUNTING (CS 8118)

Introduction
Financial Management, Financial Planning and Capitalization- definitions, objectives, changing roles and functions, Financial Decision.

Capital Budgeting
Nature of Investment decision, Importance of Capital Budgeting, The Capital. Budgeting Process - Investment Criterion, Pay-back period, Accounting, ROR (Rate of Return) Method, Discounting Cash flow method, Net – present value method, IRR (Internal Rate of Return) method, The benefit-Cost Ratio method.

Management of Working Capital

Various concepts, Elements, Classification, Financing and importance of working capital, Investment analysis, Cash flow determination, cost of capital, capital budgeting methods.

Budgeting Control Technique
Concepts of Budget, budgeting and budgetary control, Objectives, Functions, Uses, Advantages, Limitations; Master Budget and Report.
Cost – Volume – Profit Analysis

Classification of costs, Allocation, apportionment and absorption, Cost centers, different costing systems, Cost analysis for managerial decisions, Meaning of Linear CVP analysis, Objectives, Assumptions, Break – Even analysis, determining the Break-Even point profit, Volume graph profit, Volume ratios margin of Safety.

Introduction to Accounting
Basic accounting concepts, important definitions, uses, limitations, advantages; types of Accounting, Financial statements, introduction to Journal Accounting; different types of Vouchers, double entry bookkeeping, different types of transactions related to Financial Accounting.

Financial Control
Posting of Ledgers and preparation of Trial Balance; preparation of Balance Sheet and Profit and Loss Accounts; Controlling other departments by Financial Accounting (A practical Approach).

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.

SEMESTER - VII

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.

COMPUTER GRAPHICS (CS 6110)

Introduction to Computer Graphics & Graphics Systems
Overview of CG, definitions of CG, types of CG, storage tubes displays, CRT technologies - Raster Scan Display, Computer graphics software.
Scan Conversion
Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

2D Transformation
Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines.

Viewing

Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D Transformation & Viewing
3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space; reflection through an arbitrary plane; general parallel projection transformation; clipping, Viewport clipping, 3D viewing, perspectives & Depth Cueing.

Curves and Fractals
Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Hidden Surfaces
Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.
Color & Shading Models
Introduction, Modeling Light Intensities and Sources, Diffuse Reflection, Lambert's Cosine Law, Specular Reflection, Halftoning, Color Models - RGB Color, CMY Color.

NETWORK SECURITY (IT 8116)

Introduction
Attacks, Services, Mechanisms, Security Attacks, Security Services, Model for Network Security

Conventional Encryption and Message Confidentiality
Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution

Public Key Cryptography and Message Authentication
Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital Signatures, Key Management

Network Security Applications
Kerberos Motivation, Kerberos Version 4, PGP Notation, PGP Operational Description

IP Security
IP Security Overview, IP Security Architecture, Authentication Header

Web Security
Web Security Threats, Web Traffic Security Approaches, Overview of Secure Socket Layer and Transport Layer Security, Overview of Secure Electronic Transaction

Intruders and Viruses
Intruders, Intrusion Techniques, Password Protection, Password Selection Strategies, Intrusion Detection, Malicious Programs, Nature of Viruses, Types of Viruses, Macro Viruses, Antivirus Approaches

Firewalls
Firewall Characteristics, Types of Firewalls, Firewall Configuration

ELECTIVES I & II

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.

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.

PARALLEL PROGRAMMING (CS 7114)

Processes and processors. Shared memory. Fork. Join constructs. Basic parallel programming techniques- loop splitting, spin locks, contention barriers and row conditions.

Variations in splitting, self and indirect scheduling. Data dependency-forward and backward block scheduling. Linear recurrence relations. Backward dependency. Performance tuning overhead with number of processes, effective use of cache.

Parallel programming examples: Average, mean squared deviation, curve fitting, numerical integration, travelling salesman problem, Gaussian elimination. Discrete event time simulation.

Parallel Programming constructs in HPF, FORTRAN 95. Parallel programming under UNIX.

DATA WAREHOUSING AND DATA MINING (CS 7115)

Introduction: Data warehousing – definitions and characteristics, Multi-dimensional data model, Warehouse schema.

Data Marts: Data marts, types of data marts, loading a data mart, metadata, data model, maintenance, nature of data, software components; external data, reference data, performance issues, monitoring requirements and security in a data mart.

Online Analytical Processing: OLTP and OLAP systems, Data Modeling, LAP tools, State of the market, Arbor Essbase web, Microstrategy DSS web, Brio Technology, star schema for multi dimensional view, snowflake schema; OLAP tools.

Developing a Data Warehousing: Building of a Data Warehousing, Architectural strategies & organizational issues, design considerations, data content, distribution of data, Tools for Data Warehousing

Data Mining: Definitions; KDD(Knowledge Discovery database) versus Data Mining; DBMS versus Data Mining, Data Mining Techniques; Issues and challenges; Applications of Data Warehousing & Data mining in Government.

Association Rules: A priori algorithm, Partition algorithm, Dynamic inset counting algorithm, FP – tree growth algorithm; Generalized association rule.

Clustering Techniques: Clustering paradigm, Partition algorithms, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; Categorical clustering, STIRR, ROCK, CACTUS.

Decision Trees: Tree construction principle, Best split, Splitting indices, Splitting criteria, Decision tree construction with presorting.

Web Mining: Web content Mining, Web structure Mining, Web usage Mining, Text Mining. Temporal and Spatial Data Mining: Basic concepts of temporal data Mining, The GSP algorithm, SPADE, SPIRIT, WUM.

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

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).

PATTERN ANALYSIS & MACHINE INTELLIGENCE (IT 7109)

Introduction
Recognition as a classification process. Decision theoretic classification. Hyper plane properties and decision functions. Minimum distance pattern classification with simple and multiple prototypes.
Clustering-K means and isodata algorithm, Pattern classification by likely hood functions, Bayes classifier, Syntactic classification. Learning through clustering, Convex and concave decision regions. Hearing and estimation of mean vector and covariance matrix. Linear and nonlinear seperability.

Trainable pattern classtier-Gradient technique, Robbins-Monre algorithm, Potential functions and least mean square error.

Feature selection by entropy minimization, Karhuner-Lucke expansion and divergence minimization.

Image representation, digitization, quantization, Compression and coding, Transfer for image processing, Restoration, Enhancement, Segmentation, thining.
Description of lines and shape. Statistical and syntactic models of image classification. Morphological method of image analysis.

Application of speech recognition, Image understanding and territory planning for mobile robots.

BIOMEDICAL ELECTRONICS (EC 7116)

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-
  - o Microelectrodes, surface electrodes, needle electrodes
  - o Reference electrode, pH electrode, blood gas electrode
  - o 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, Spiro meter.

Medical imaging systems:
- Working principles of medical X-ray, CT scan, CAT scan, Ultrasound scanning, MRI

Therapeutic & prosthetic devices:
Pacemakers, Defibrillators, ventilators, respirators, heamodialysis 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.

OPERATIONS RESEARCH AND OPTIMIZATION TECHNIQUES (EC 7117)

Introduction
Introduction to OR modeling approach and various real life situations

Linear programming problems
Basic LPP and applications, Various components of LP problem formulation

Solving Linear Programming problem
Solving LPP using simultaneous equations and Graphical Method Simplex Method and extensions. Sensitivity analysis , Duality theory Revised Simplex, Transportation and assignment problems.

Network Analysis
Shortest paths, Maximal flow including PERT-CPM

Integer programming
Basic concepts, formulation, solution and applications

Dynamic programming
Modeling, Optimization, Replacement

Game theory
Introduction, Decisions under risk, Decisions under uncertainty
Queuing Theory
Introduction, basic definitions and notations, axiomatic derivation of the arrival & departure distributions for Poission Queue, Poission Queuing Model, M/M/1 queues in series, application

GEOGRAPHICAL INFORMATION SYSTEM (CS 7116)

Introduction and Overview of Geographic Information Systems
Definition of a GIS, features and functions; why GIS is important; how GIS is applied; GIS as an Information System; GIS and cartography; contributing and allied disciplines; GIS data feeds; historical development of GIS.

GIS and Maps, Map Projections and Coordinate Systems
Maps and their characteristics (selection, abstraction, scale, etc.); automated cartography versus GIS; map projections; coordinate systems; precision and error.

Data Sources, Data Input , Data Quality and Database Concepts
Major data feeds to GIS and their characteristics: maps, GPS, images, databases, commercial data; locating and evaluating data; data formats; data quality; metadata. Database concepts and components; flat files; relational database systems; data modeling; views of the database; normalization; databases and GIS.

Spatial Analysis
Questions a GIS can answer; GIS analytical functions; vector analysis including topological overlay; raster analysis; statistics; integrated spatial analysis.

Making Maps
Parts of a map; map functions in GIS; map design and map elements; choosing a map type; producing a map formats, plotters and media; online and CD-ROM distribution; interactive maps and the Web.
Implementing a GIS
Planning a GIS; requirements; pilot projects; case studies; data management; personnel and skill sets; costs and benefits; selecting a GIS package; professional GIS packages; desktop GIS; embedded GIS; public domain and low-cost packages.

Technology & Instruments involved in GIS & Remote Sensing
GIS applications; GIS application areas and user segments; creating custom GIS software applications; user interfaces; case studies. Future data; future hardware; future software; Object-oriented concepts and GIS; future issues – data ownership, privacy, education; GIS career options and how to pursue them.

Remote Sensing
Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, Remote sensing of Vegetation, Remote sensing of water, urban landscape

LINUX PROGRAMMING & SYSTEM ADMINISTRATION (CS 8120)

Introduction to System Administration]
Essential Administrative Tools.
Starting and shutdown
User Accounts
Security
TCP / IP Network Management
Getting started in LINUX
Linux Data Management
POSIX Threads
Pipes, Semaphores, Message Queues, Shared Memory, Sockets
Tool Command Language
PERL & CGI.

SEMESTER-VIII

MULTIMEDIA TECHNOLOGY (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

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

ELECTIVES III, IV & V

E-COMMERCE & SECURITY (CS 8117)

Introduction to E-Commerce: Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Business to Business E-Commerce: Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce.

Legal issues: Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Security Issues: Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security.

Business to Consumer E-Commerce: Consumer trade transaction, Internet, Page on the Web, Elements of E-Commerce with VB, ASP, SQL.

E-business: Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

NATURAL LANGUAGE PROCESSING (CS 8119)

Introduction to NLP
Definition, issues and strategies, application domain, tools for NLP, Linguistic organisation of
NLP, NLP vs PLP.

Word Classes

Review of Regular Expressions, CFG and different parsing techniques
Morphology: Inflectional, derivational, parsing and parsing with FST, Combinational Rules

Phonology: Speech sounds, phonetic transcription, phoneme and phonological rules, optimality
theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis.

Pronunciation, Spelling and N-grams: Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model,
counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing),
N-grams for spelling and pronunciation.

Syntax
POS Tagging: Tagsets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging
Sentence level construction & unification: Noun phrase, co-ordination, sub-categorization, concept of feature structure and unification.

Semantics
Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC
Semantic Analysis: Syntax driven, attachment & integration, robustness

Lexical Semantics: Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, internal structure of words, metaphor and metonymy and their computational approaches

Word Sense Disambiguation: Selectional restriction based, machine learning based and dictionary based approaches.

Pragmatics   :
Discourse: Reference resolution and phenomena, syntactic and semantic constraints on Coreference, pronoun resolution algorithm, text coherence, discourse structure

Dialogues: Turns and utterances, grounding, dialogue acts and structures
Natural Language Generation: Introduction to language generation, architecture, dicourse planning (text schemata, rhetorical relations).

MANAGEMENT INFORMATION SYSTEM (IT 7106)

1. Introduction
   Definition of management, its definition, purpose, elements of science, patterns of management analysis.
   Functions of managers.
2. People & organization.
   People: psychological factors, worker's skill & abilities.

Organization: Organizational characteristics, Organizational behaviour, corporate culture, power inter-group conflict, intra-group dynamics, the MIS function in organization, MIS personal, computer operation personal, MIS management.

3. System & models.
   System: components of a system, environment, open Vs Closed systems.
   Models: modeling systems general vs specific models, levels of models, types of models. Models of organizational systems. A general model of organization and its internal environment. Strategic planning models.
4. Management & decision making
   Management: labels of management, managerial role, planning & control, Managerial styles, Managerial decision making: characteristics of types of decision
5. Decision making process.
   Intelligence, design, sol^n evaluation & choice.
6. Evaluating decision making.
   Effectiveness vs efficiency
7. Transaction processing & management reporting systems.
   A management information systems frame work:
   ----- Transaction processing framework
   ----- Management reporting system
   ----- Decision support system.
   ----- Knowledge based systems
   ----- Office systems
8. Transaction processing.
   - Nature
   - Function
   - role of IT in transaction processing
   - processing cycles
   - Transaction processing subsystem.
9. Management reporting system.
   Evaluation of management reporting system, types of reports, structuring report content.
10. Decision support system (DSS).
    Component of DSS
    DSS development
    DSS products
    DSS development tools
    User interfaces
    Executive information system (EIS)
    Executive roles & decision making.
    Executive decision making environment
11. MIS in the functional areas of business.
    Financial information system,
    Marketing MIS
    Manufacturing MIS
12. Enterprise resource planning
    Materials Requirement planning (MRP)
    Closed loop MRP
    Manufacturing Resource Planning (MRP – II)
    ENTERPRISE RESOURCE PLANNING
    Functional architecture of ERP

Benefits of ERP
Business Process Reengineering and ERP
ERP implementation
13. Supply chain management
Introduction
Definition of SCM
Features of SCM
SCM Stages
14. Cases in MIS
Case study method
Analytical Case
Issue Case
Written Case Analysis
Illustrations

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, QualityManagement, Sales&Distribution
ERPPackage,
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

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

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 deadlines & 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.

BIO INFORMATICS (IT 8110)

Introduction to Genomic data and Data Organization: Sequence Data Banks – Introduction to sequence date banks – protein sequence data bank. NBFR-PIR, SWISSPROT, Signal peptide data bank, Nucleic acid sequence data bank – GenBank, EMBL nucleotide sequence data bank, AIDS virus sequence data bank. RRNA data bank, structural data banks – protein Data Bank (PDB), The Cambridge Structural Database (CSD) : Genome data bank – Metabolic pathway data : Microbial and Cellular Data Banks.

Introduction to MSDN (Microbial Strain Data Network): Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; other important Data banks in the area of Biotechnology/life sciences/biodiversity.

Sequence analysis: Analysis Tools for Sequence Data Banks; Pair wise alignment - NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to analyze sequence data: Sequence patterns motifs and profiles.

Secondary Structure predictions; prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking.

Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm, Hidden-Markov model, Neural Networking.

Applications in Biotechnology: Protein classifications, Fold libraries, Protein structure prediction: Fold recognition (threading), Protein structure predictions : Comparative modeling (Homology), Advanced topics: Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.

INFORMATION & CODING THEORY (CS 8121)

Source Coding
Uncertainty and information, average mutual information and entropy, information measures for continuous random variables, source coding theorem, Huffman codes.
Channel Capacity And Coding
Channel models, channel capacity, channel coding, information capacity theorem, the Shannon limit.

Linear And Block Codes For Error Correction
Matrix description of linear block codes, equivalent codes, parity check matrix, decoding of a linear block code, perfect codes, and Hamming codes.

Cyclic Codes
Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, Golay codes.

BCH Codes
Primitive elements, minimal polynomials, generator polynomials in terms of minimal polynomials, examples of BCH codes.

Convolutional Codes
Tree codes, trellis codes, polynomial description of convolutional codes, distance notions for convolutional codes, the generating function, matrix representation of convolutional codes, decoding of convolutional codes, distance and performance bounds for convolutional codes, Examples of convolutional codes, Turbo codes, Turbo decoding.

IMAGE PROCESSING (IT 8111)

Introduction
Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.

Digital Image Formation
A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries
Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of the Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.

Image Enhancement
Spatial Domain Method, Frequency Domain Method, Contrast Enhancement –Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative

Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.

Image Restoration
Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.

Image Segmentation
Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.

DISTRIBUTED COMPUTING (IT 8112)

Fundamentals

Introduction, Models and Features, Concept of distributed operating system, Issues in design of a distributed operating system.
Message Passing
Good message passing system, IPC, Synchronization, Buffering, Multi datagram messages, Encoding & decoding techniques, Process addressing, Failure handling, Group communication; Remote procedure calls (RPC) - Models, Communication protocols, RPC, Lightweight RPC.

Distributed Shared Memory
Architecture, Thrashing, Granularity, Advantages.

Synchronization
Introduction, Clock Synchronization, Event handling, Mutual Exclusion; Deadlock-conditions, Avoidance, Prevention, Recovery.

Resource & process Management
Features of a good scheduling algorithm, Task assignment approach, Load balancing & load sharing approach, Introduction to process management, Process migration, Threads.

Distributed Files Systems
Introduction, Features, Models, Accessing models; sharing Semantics & caching schemes, replication, Fault Tolerance, Atomic transactions.

Naming
Introduction, Features, Fundamental Terminologies & concepts, System oriented names, Human oriented names, Name caches.

Security
Potential attacks to computer system, Cryptography, Authentication, digital signatures, Access Control.

BUSINESS INFORMATION SYSTEM (IT 8113)

Introduction   : Introduction to BIS and Mainframe Computer, Hardware configuration, 360/370 family: Processor, Multiprogramming, Channels, Input-Output device, Application, Characteristics of Mainframe Operating System: Batch processing, Virtual Storage, Spooling, Timesharing, Multiprogramming, Mainframe configuration: Small Mainframe configuration, 3090 configuration

COBOL Programming: Organization & Structure of COBOL program, Coding format, Identification and Environment Division- Configuration section, Input-Output section, Data Division- File section, Working storage section, Usage clause, synchronized clause, justified clause, redefines clause, renames clause, sign clause. Procedure Division- Structure of procedure division, data movement, arithmetic, sequence control, input output & conditional verbs. Table Handling- OCCURS clause and subscripting, multidimensional table, Perform, Set, Search verbs, index table and indexing, sorting a table. Structure of COBOL subroutines; Calling Subroutines, State of subroutines and CANCEL statement.

COBOL Files: Sequential file characteristics, File-control entries, File description-Fixed length record, Statements for sequential files, Sequential files with variable length record, Features for unit record files, special features for magnetic-tape files, I-O-CONTROL paragraph. Sort & merge verbs, File updating, Same sort area clause, Memory size clause; Direct Access Files- Relative files, Indexed sequential files; Creating reports.

Job Control Language (JCL): Introduction to JCL : Mainframe information representation & Storage , Sequential data set , Partition data Set , Index file , Structure of JCL , JOB statement, EXEC statement, DD statement, Procedures & symbolic parameters, Compile – Link – Execute JCL, IBM utility: IEBGENER, IEBCOPY, IEHPROGM, IEBCOMPR .

VSAM: Introduction to VSAM, AMS, Defining & loading KSDS, ESDS, RRDS.
An Overview of DB2: Introduction, Environment, Major components of DB2, DBRM, BIND, PLANS, DB2 internals: DB2 objects, optimizers, DB2 catalog & directory, Data locking.

PRINCIPLES OF LANGUAGE TRANSLATION (IT 8114)

Introduction: Types of translators – Pre-processor, Compiler, Interpreter, Macro processor, Assembler; Programming language concepts- their characteristics and applications.
Basic concepts of Compilers- Phases of the Compiler, Cross-Compiler, Compiler-Writing tools, Bootstrapping.

Lexical Analysis: Role of Lexical Analyzer, Tokens- Specifications & Recognition, Input buffering, Design of Lexical Analyzer generator.

Syntax Analysis: Parsing techniques- Top–Down and Bottom–Up parsing; Basic concepts of Left-recursions and Left – factoring; Formation of FIRST and FOLLOW sets and checking for the LL(1) acceptance. Basic concepts of Handles, Viable prefixes, Operator precedence parsing, LR parsers- SLR, Canonical LR(1), LALR. Error recovery strategies for different parsing techniques.

Syntax Directed Translation: Syntax Directed Translation Scheme SDTS- Definitions, Different rules for writing semantic actions and their applications; Construction of Syntax trees, Definition of Abstract Translation Scheme (ATS) and its application. Bottom-Up evaluation of inherited attributes.

Run Time Environments: Source language issues - Activation trees, Control stack, Scope of declaration, Binding of names. Storage organization-Subdivision of run-time memory, Activation records. Storage allocation strategies, Parameter passing - call by value, call by reference, copy restore, call by name. Symbol tables, Dynamic storage allocation techniques.

Intermediate Code generation: Intermediate languages, Basic statement formation, Graphical representation, Three-address code, Implementation of three address statements - Quadruples, Triples, Indirect triples. Boolean expressions, Case statements, Backpatching.

Code Optimization and Generation   : Introduction, Basic blocks & flow graphs, Transformation of basic blocks, DAG representation of basic blocks, Types of optimization - Loops in flow graph, Dataflow analysis using GEN and KILL, forming the IN and OUT of basic blocks; Peephole optimization; Simple code generator; Code generation from DAGs; Allocation of Registers required for the generation
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ADVANCED JAVA PROGRAMMING (IT 8115)

Client & server side programming.
Enterprise architecture styles: Single tier , 2-tier , 3-tier, n-tier; Relative comparison of the different layers of architectures.
MVC Architecture: Explanation, Need, Drawbacks, J2EE WEB SERVICES, Different components & containers.

Servlet: Introduction, Advantages over CGI, How it works?, Servlet life cycle, Servlet API (Different interfaces & classes of generic servlet & HTTP servlet), Accessing user information by means of Request & Response, Servlet session management techniques and relative comparison.

JSP: Introduction, Comparison between JSP & servlet., Architecture/Life cycle, Different types of JSP architectures and relative comparison.; JSP tags ,Directives, Scripting elements, Actions; JSP implicit objects, Accessing user information using implicit objects.

EJB :Introduction, Comparison of EJB & Java Beans , Applications, Drawbacks, Different types of enterprise beans ,Services provided by EJB container.

RMI: Introduction and applications, Architecture ,Use of RMI Registry.
JNDI: Introduction and applications, Comparison between LDAP and JNDI
JDO (Java Data Objects): Introduction, Integration of EJB and JDO, JDO & RMI
JINI :Introduction, Applications

JDBC: Introduction, Database driver ,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC prepared statements, JDBC data sources.

XML: Java & XML, XML syntax, Document type definition., Parsers, SAX parsers, DOM

parsers, SAX vs. Dom, JAXP and JAXB.

PATTERN RECOGNITION (IT 8117)

Topic Syllabus
1. Introduction
Examples; The nature of statistical pattern recognition; Three learning paradigms; The sub-problems of pattern recognition; The basic structure of a pattern recognition system; Comparing classifiers.
2. Bayes Decision Theory
General framework; Optimal decisions; Classification; Simple performance bounds.
3. Learning - Parametric
Approaches
Basic statistical issues; Sources of classification error; Bias and variance; Three approaches to classification: density estimation, regression and discriminant analysis; Empirical error criteria; Optimization methods; Failure of MLE;
4. Parametric Discriminant
Functions
Linear and quadratic discriminants; Shrinkage; Logistic classification; Generalized linear classifiers; Perceptrons; Maximum Margin; Error Correcting Codes;
5. Error Assessment
Sample error and true error; Error rate estimation; Confidence intervals; Resampling methods; Regularization; Model selection; Minimum description length; Comparing classifiers
6. Nonparametric Classification

Histograms rules; Nearest neighbor methods; Kernel approaches; Local polynomial fitting; Flexible metrics; Automatic kernels methods
7. Feature Extraction
Optimal features; Optimal linear transformations; Linear and nonlinear principal components; Feature subset selection; Feature Extraction and classification stages, Unsupervised learning and clustering, Syntactic pattern recognition, Fuzzy set Theoretic approach to PR,
8. Margins and Kernel Based
Algorithms
Advanced algorithms based on the notions of margins and kernels
9. Applications of PR
Speech and speaker recognition, Character recognition, Scene analysis.

DISTRIBUTED DATABASE (IT 8118)

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design – fragmentation, allocation criteria.

Storage mechanisms. Translation of global queries. / Global query optimisation. Query execution and access plan. Concurrency control – 2 phases locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects. Node and link failure recoveries.

Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

Alternative architecture. Development tasks, Operation- global task management. Client server databases-SQL server, open database connectivity. Constructing an application.