

## **MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE (MCA-101)**

### **UNIT – I**

**RELATION:** Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation.

**Function:** Types, Composition of function, Recursively defined function

**Mathematical Induction:** Piano's axioms, Mathematical Induction

Discrete Numeric Functions and Generating functions

Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients, Asymptotic Behaviour of functions

**Algebraic Structures:** Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

### **UNIT – II**

Propositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram,

Lattices: Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorphic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.

### **Unit – III**

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph.

### **Unit – IV**

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with our Moore machine, Mealy machine, Conversions.

### **Unit – V**

Non regular language: Pumping Lemma, Myhill Nerode Theorem, Pushdown Automata, and Introduction to Turning Machine and its elementary applications to recognition of a language and computation of functions.

### **References**

1. Lipschutz, Seymour, "Discrete Mathematics", TMH
2. Trembley, J.P. & R. Manohar, "Discrete mathematical Structure with Application to Computer Science", TMH
3. Kenneth H. Rosen, "Discrete Mathematics and its applications", TMH
4. Doerr Alan and Levasseur Kenneth, "Applied Discrete Structure for Computer Science", Galgotia Pub. Pvt. Ltd.
5. Gersting "Mathematical Structure for Computer Science", WH freeman and Macmillan
6. Kumar Rajendra, "Theory of Automata: Languages and Computation", PPM
7. Hopcroft J.E. Ullman J.D., "Introduction to Automata Theory, Language and Computation" Narosa Pub. House, New Delhi
8. C.L.Liu "Elements of Discrete Mathematics", McGraw Hill
9. Peter Grossman, "Discrete Mathematics for Computer", Palgrave Macmillan

## **ACCOUNTING AND FINANCIAL MANAGEMENT (MCA – 102 )**

### **UNIT – I**

**Accounting:** Principles, Concepts and conventions, double entry system of accounting, Ledger posting and Trial balance.

**Final Accounts:** Trading, profit and loss accounts and balance sheet of sole proprietary concern with normal closing entries. Introduction to manufacturing account of partnership firms, limited company.

### **UNIT – II**

**Financial Management:** Meaning, role and scope of financial Management.

Basic Financial Concepts: Time value of Money, present value, future value of a series of cash flows, annuity, Practical applications of compounding and present value techniques.

**Long-term source of finance:** Introduction to shares, debenture, preference shares.

### **Unit – III**

**Capital Budgeting:** Meaning, importance, difficulties, Introduction to evaluation techniques – Traditional techniques (ARR Payback method). Discounting cash flow techniques (Present value, NPV, IRR)

**Ratio Analysis:** Meaning, advantages, limitations of ratio analysis, Types of ratios and their usefulness.

### **Unit – IV**

**Costing:** Nature, importance and Types of cost

**Marginal costing:** Nature, scope and importance of marginal costing. Break-even analysis, its uses and limitations, construction of break-even charts. Practical applications of marginal costing.

**Inventory Control System:** The need, cost of inventory, methods of inventory costing.

### **Unit – V**

**Introduction to Computerized Accounting System:** Coding logic and codes required, master files, transaction files, introduction to documents used for data collection. Processing of different files and outputs obtained.

### **References:**

1. S.N. Maheswari & S.K. Maheshwari, "Introduction of Fincncial Accountancy" Vikas Pulication.
2. S.N. Maheshwari & S.K. Maheshwari, "Advanced Accountancy" Vikas Pub.
3. S.N. Maheshwari & S.K. Maheshwari "Financial Management, Vikas Pub.
4. Jawahar Lal "Financial Accounting" Wheelder publishing
5. Khan & Jain "Management Accounting" Tata McGraw Hill publication
6. K.S. Sastry & Nand Dhamesa, "The practices of Mgmt. Accounting, Wheeled Publications.
7. I.M. Pandey "Financial Management" Vikas Publication.
8. J.Khan & Jain "Financial management" Tata McGraw Hill Publication
9. Geoffrey Knott "Financial Management" Palgrve Macmillan.

## **COMPUTER ORGANIZATION (MCA – 103 )**

### **Unit-I (Representation of information & Basic Building Blocks)**

Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD), ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry look ahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (Synchronous and asynchronous), ALU, Micro-operation.  
ALU-chip, Faster Algorithm and Implementation (multiplication & Division)

### **Unit – II (Basic Organization)**

Von Neumann Machine (IAS Computer), Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers.

### **Unit – III (Memory Organization)**

Memory hierarchy, Main memory (RAM/ROM) chips), Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

### **Unit – IV (I/O Organization)**

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication.  
I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

### **Unit – V (Process Organization)**

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8085): Addition of two numbers, Subtraction , Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn's and Feng's Classification, Parallel Architectural classification.

### **References:**

1. William Stallings, "Computer Organization & Architecture" Pearson Education Asia
2. Mano Morris, "Computer System Architecture" PHI
3. Zaky & Hamacher, "Computer Organization: McGraw Hill
4. B. Ram, "Computer Fundamental Architecture & Organization" New Age
5. Tannenbaum, "Structured Computer Organization" PHI.

## **COMPUTER & C PROGRAMMING (MCA – 104 )**

### **Unit – I**

**Introduction to Computers:** Computer hardware Components, Disk Storage, memory, keyboard, mouse, printers, monitors, CD etc., and their functions, Comparison Based analysis of various hardware components.

### **Unit – II**

**Basic Operating System Concepts:** MS-DOS, WINDOWS, Functional knowledge of these operating systems. Introduction to Basic Commands of DOS, Managing File and Directories in various operating Systems, Introduction to internet, Basic terms related with Internet, TCP/IP.

### **Unit – III**

**Programming in C:** History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programmes. Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor

### **Unit – IV**

**Operators:** Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, precedence and order of evaluation.

**Control Statements:** if-else, switch, break, continue, the comma operator, goto statement.

**Loops:** for, while, do-while.

**Functions:** built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.

**Arrays:** Linear arrays, multidimensional arrays, Passing arrays to functions, Arrays and strings.

### **Unit – V**

**Structure and Union:** Definition and differences, self-referential structure.

And address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.

File Handling in C: Opening and closing and data file, creating a data file, read and write functions, unformatted data files.

### **References:**

1. V. Rajaraman, “Fundamentals of Computers”, PHI
2. Peter Norton’s “Introduction to Computer”, TMH
3. Hahn, “The Internet complete reference”, TMH
4. Peter Norton’s, “DOS Guide”, Prentice Hall of India
5. Gottfried, “Programming in C, Schaum’s Series Tata McGraw Hill

**COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**  
**(MCA-105)**

**Unit – I**

Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation.

**Iterative Methods:** Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

**Unit – II**

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence.

**Interpolation and approximation:** Finite Differences, Difference tables.

Polynomial Interpolation: Newton's forward and backward formula

Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.

**Interpolation with unequal intervals:** Lagrange's Interpolation, Newton Divided difference formula, Hermite's interpolation Approximation of function by Taylor's series and Chebyshev polynomial.

**Unit – III**

**Numerical Differentiation and Integration:** Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule Euler-Maclaurin Formula

**Solution of Differential Equations:** Picard's Method, Euler's Method, Taylor's Method,

Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

**Unit-IV**

**Curve fitting, Cubic Spline and Approximation:** Method of least squares, fitting of straight lines, polynomials, exponential curves etc.

**Frequency Chart:** Different frequency chart like Histogram, Frequency curve, Pi-chart

**Regression Analysis:** Linear and Non-linear regression, Multiple regression

**Unit-V**

**Time Series and Forecasting:** Moving averages, smoothening of curves, forecasting models and methods, Statistical Quality Controls methods.

Testing of Hypothesis: Test of significance, Chi-square test, t-test, ANOVA, F-Test

Application to medicine, agriculture etc.

#### References:

1. Rajaraman V., :Computer Oriented Numerical Methods". PHI
2. Gerald and Wheatley, "Applied Numerical Analyses", AW
3. Jain, Lyengar and Jain, "Numerical Methods for Scientific and Engineering Computations:", New Ager Int.
4. Grewal B.S., "Numerical methods in Engineering and Science:. Khanna Publishers, Delhi
5. T.Veerarajan, T Ramchandran, "Theory and Problems of Numerical Methods", TMH
6. Pradip Niyogi, :Numerical Analysis and Algorithms:, TMH
7. Francis Scheld, "Numerical Analysis", TMH
8. Gupta S.P., "Statistical Meythods", Sultan & Sons

#### COMBINATORICS & GRAPH THEORY (MCA-106)

##### Unit-I

Rules of sum and products, Permutation, Combination, Permutation groups and application, Probability, Remsey Theory, Discrete numeric function and generating function, Combinatorial problems, Difference equation.

##### Unit-II

Recurrence Relation-Introduction, Linear recurrence relation with constant coefficient, Homogeneous solution, Particular solution, Total solution, Solution by the method of generating function.

##### Unit-III

Graphis, sub-graphs, some basic properties, Walks, Path & circuits, Connected graphs, Disconnected graphs and component, Euler and Hamiltonian graphs, Various operation on graphs, Tree and fundamental circuits, Distance diameters, Radius and pendent vertices, Rooted and binary trees, Counting trees, Spanning trees, Finding all spanning trees of a graph and a weighted graph.

##### Unit-IV

Cut-sets and cut vertices, some basic properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and seperatability, Network flows, mincut theorem, Planner graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings, Vector space of a graph and vectors, basis vectors, cut set vector, circuit vector, circuit and cut set verses sub spaces, orthogonal vector and sub space.

Indicidence matrix of graphs, sub matrices pf  $A(G)$ , circuit matrix, cut set matrix, path matrix and relationship among  $A_f$ ,  $B_f$ ,  $C_f$  fundamental circuit matrix and range of  $B_f$  adjacency matrix, rank nullity theorem.

##### Unit-V

Coloring and covering partitioning of graph, Chromatic number, Chormatic partitioning, Chromatic polynomials, Matching, covering, Four color problem,

Directed graph, Types of directed graphs, Directed paths and connectedness, Euler digraph, Tree and directed edges, Fundamental circuit in digraph, Matrices A,B,C of digraph adjacency matrix of digraph, Enumeration and its types, counting of labeled and unlabeled trees, Polya's theorem, Graph enumeration with polyas theorem, Graph theoretic algorithm.

Reference:

1. Deo Narsing, :Graph Theory with applications to engineering and computer science", PHI
2. Tremblay and Manohar, :Discrete mathematical structures with applications to computer Science:, TMH
3. Joshi K.D., "Fundamental of discrete mathematics:, New Age International
4. John Truss, "Discrete mathematics of computer scientist"
5. C.L. Liu, "Discrete mathematics"

**ORGANIZATIONAL STRUCTURE AND PERSONNEL MANAGEMENT**  
**((MCA-201))**

**Unit-I**

**Organization Structure:** Classical theories of Management: Scientific management theory, Fayol's 14 principles of Management Weber's bureaucratic theory. Definition of organization and organization Structure..

**Some Concepts Regarding Organization Structure:** Line and Staff authority, Centralization and Decentralization, Span of control, Formal and Informal Organization.

**Forms of Organization Structure and Feature:** Function bases, Product bases, Geography based, Project based (Matrix)

**Organization Design:** Mechanistic and Organic Structure, Virtual and Network organization Structure.

**Unit-II**

**Motivation:** Definition of Motivation, Importance of Motivation, Motivation and behaviour, Theories of Motivation – Maslows need Hierarchy, Two-Factor Theory, McClelland's Need Theory, Theory X and Theory Y.

**Unit-III**

Nature and Scope of Human Resource Management; Scope of HRM, HRM-function and objectives, HRM model.

**Personnel Function:** Personnel policies and principles, duties and responsibilities of personnel manager, differences between HRM and PM Emerging trends of personnel management in India

**Unit-IV**

**Human Resource Planning:** Meaning, definition and importance of HRP.

**Job Analysis:** Meaning and definition, process of job analysis

**Recruitment:** Meaning and definition, importance, sources of recruitment. Indian scenario.

**Selection:** Meaning and definition, selection process, types of interview.

**Unit-V**

**Training and Development:** Nature of training and Development, Inputs in training and Development, importance of training and Development, training process, training of International assignment.

**Reference Books:**

1. L.M. Prasad “Organizational Behavior”, S.Chand
2. V.S.P. Rao, P.S. Narayana, “Organizational Theory and Behaviour”  
Konark Publishers Pvt. Ltd.
3. Tripathi, Reddy, “Principles of Management:.. TMH
4. Koontz, Weihrich, “Essentials of Management:;, TMH
5. Fred Luthans, :Organizational Behaviour”, McGraw Hill
6. K. Aswathappa, “Human Resources and Personnel Management”, TMH
7. L.M. Prasad, “Human Resource management”, S.Chand

## **DATA AND FILE STRUCTURE USING “C” (MCA-202)**

**Unit-I Introduction:** Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered list, Sparse Matrices, and Vector.

**Stacks:** Array Representation and Implementation of stack, Operations and Stacks: Push and POP, Array Representation of Stack, Linked Representation of stack, Operations Associated with Stacks, Application of stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

**Recursion:** Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

### **Unit-II**

**Queues:** Array and linked representation and implementation of queues, Operations on Queue; Create, Add, Delete, Full and Empty, Circular queue, Deque, and Priority Queue.

**Link List:** Representation and implementation of Singly linked lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List of Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

### **Unit-II**

**Trees:** Basic terminology, Binary Tree, Binary tree representation algebraic Expressions, Complete Binary Tree, Extended Binary Tree, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary tree, Huffman algorithm.

Searching and Hashing: Sequential search, comparison and analysis, Hash Table, Hash Function, Collection Resolution Strategies, Hash Table Implementation.

### **Unit-IV**

**Sorting:** Insertion Sort, Bubble sorting, Quick Sort, Two way Merge Sort, Heap Sort, Sorting on Different Keys, Practical Consideration for Internal Sorting.

**Binary Search Trees:** Binary Search (BST), Insertion and Deletion in BST, Complexity of search Algorithm, Path Length, AVL Tree, B-trees.

### **Unit-V**

**Graphs:** Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

**File Structures:** Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files B Tree index Files, Indexing and Hashing Comparisons.

**References**

1. Horowitz and Sahani, "Fundamentals of data Structures" Galgotia
2. R. Kruse etal, "Data Structures and Program Design in C" Person Education
3. A.M. Tenenbaum etal, "Data Structures and Program Design in C" Person Education
4. Lipschutz, "Data Structure", TMH
5. K Loudon, "Mastering Algorithms With C", Shroff Publishers and Distributors
6. Bruno R Preiss, "Data Structure and Algorithms with Object Oriented Design Pattern in C++, Jhon Wiley & Sons, Inc.
7. Adm Frozdek, "Data Structures and Algorithms in C++" Thomson Asia
8. Pal G. Sorenson, "An Introduction to Data Structures with Application", TMH

## UNIX AND SHELL PROGRAMMING (MCA-203)

### Unit-I

**Introduction:** Introduction to Unix, Unix system organization (the kernel and the shell), Files and directories, Library functions and system calls, Editors (vi and ed).

### Unit-II

**Unix Shell Programming:** Types of Shells, Shell Metacharacters, Shell scripts, Shell commands, the environment, Integer arithmetic and string Manipulation, Special command line characters, Design making and loop control, controlling terminal input, trapping signals, arrays.

### Unit-III

**Portability with C:** Command line Argument, Background processes, processes, Process synchronization, Sharing of data, user-id, group-id, pipes, fifos, message queuces, semaphores, shared variables, Introduction to socket programming.

### Unit-IV

**Unix System Administration:** File system, mounting and unmounting file system, System booting, shutting down, handling user account, backup, recovery security, creating files, storage of Files, Disk related commands.

### Unit-V

**Different tools and Debugger:** System development tools: lint, make, SCCS (source code control system), Language development tools: YACC, LEX, M4, Text formatting tools: nroff, troff, tbl eqn, pic, Debugger tools: Dbx, Abx, Sdb, Strip and Ctrace.

### References

1. Parata, "Advanced Unix Programming guide". BPB
2. Yashwant KANITKAR, "Unix Shell Programming", BPB
3. Meeta Handhi, Tilak Shetty, Rajiv Shah "The 'C' Odyssey Unix-ythe open boundless C", BPB
4. Sumita;bh Das, "Unix Concepts and applications". TMH
5. Mike Joy, Stephen Jarvis, Michael Luck, 'Introducing Unix and Linux', Palgrave Macmillan
6. Rachel Morgan, Hanery McGilton, "Introducing Unix System V", TMH

## **PARADIGMS OF PROGRAMMING (MCA-204)**

### **Unit-I**

**Introduction:** Characteristics of programming Languages, Factors influencing the evolution of programming language, Development in programming methodologies, desirable features and design issues.

**Programming Language Processors:** Structures and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

### **Unit-II**

**Elementary and Structured data type:** Data object variables, constants, data type, elementary data types, declaration, assignments and initialization, enumeration, characters strings.

**Structured data Type and Objects:** Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, set files.

**Imperative Languages:** Block structure, Scope rules Parameter Passing, Construct like co-routines, Tasks etc.

### **Unit-III**

**Object Oriented Languages:** The class notion-Information hiding and data abstraction using classes, derived classes and inheritance-Polymorphism-Parameterized types.

### **Unit-IV**

**Functional Languages:** Functional programming concepts – Referential transparency – Types – Type systems – Names, bindings environment and scope – Recursive functions – Polymorphic function – Types variables – High order functions – Curried functions – Lists and programming with lists – Definition of new user defined types in ML – Abstract data types – Evaluation methods.

### **Unit- V**

**Logic Languages:** Review of predicate logic – Clause form logic – Logic as a programming language-Unification algorithm – Abstract interpreter for logic programs – Theory of logic programs – SLD resolution – Negation as failure extension.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PH
2. Sethi, "Programming Language" Addison Wesley
3. E Horowitz, "Fundamental of Programming Languages", Galgotia
4. Pratt, Zolkowitz, "Programming Languages Design Implementation", Pearson Edition
5. Tucker Noonan, "Programming Languages: Principles and Paradigms:", TMH
6. D.A. Watt, "Programming Languages and Paradigms" PH

7. J. Lloyd, "Foundation of Logic Programming" Springer verlag
8. M. Hennessey, "The Semantics of Programming Languages", John Wiley
9. C. Reade, "Elements of Functional Programming", AW
- 10.L.C. Paulson, "ML for working programmer", Cambridge university press
- 11.B. Stroustrup, " The C++ Programming Language" AW

## **SYSTEM ANALYSIS AND DESIGN (MCA-205)**

### **Unit-I**

**System Concepts and Information System Environment:** The System Concept, Definition, Characteristics of Systems, Elements of a System, Open and Closed and closed system, Formal & Informal Information Systems, Computer based Information Systems, Management Information System, Decision Support System, General Business Knowledge, and Interpersonal Communicational System.

### **Unit-II**

**The System Development Life Cycle:** Recognition of needs, Impetus for System Change, Feasibility Study, Analysis, Design, Implementation, Post implementation & Maintenance.

**The Role of the Systems Analyst:** Historical Perspective, The War Effort, What Does it take to do system Analysis, Academic & Personal Qualifications, The Multifaceted role of the Analyst, The Analyst/User Interface, Behavioral issues.

### **Unit-III**

**Systems Planning & Initial Investigation:** Strategies for Determining Information Requirement, Problem Definition & Project initiation, Background Analysis, Fact Analysis, Review of Written Documents, Onsite Observations, Interviews & Questionnaires, Fact Analysis, Performance Analysis, Efficiency Analysis, Service Analysis.

### **Unit-IV**

**Information Gathering:** What kind of Information do we need? Information about the firms, Information gathering tools, The art of Interviewing, Arranging the Interview, Guides to Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

**The Tools of Structured Analysis:** The Dataflow Diagram (DFD), Data Dictionary, Decision Trees and Structured English.

### **Unit-V**

Feasibility Study: System performance, Economic Feasibility, Technical Feasibility, Behavioral Feasibility, Steps in Feasibility Analysis

Input/Output and Forms Design: Input Design, CRT Screen Design, Output Design, Requirements form Design

H/W/S/W Selection and Maintenance: The Computer Industry, S/W Industry, a procedure for H/W/S/W Selection, Major Phases in selection, Criteria for S/W Selection, The Used Computer, The Computer Contract.

## References

1. Elias M.Awad, "Systems Analysis & Design" Galgotia Publication
2. Hoffer, "Modern Systems Analysis & Design" Addison Wesley
3. Kendall, "Introduction to System Analysis & Design", McGraw Hill

## **COMPUTER ARCHITECTURE & MICROPROCESSOR (MCA-206)**

### **Unit-I**

Introduction to Parallel computing, Parallelism in Uniprocessor Systems, Parallel computer structures, Architectural Classification schemes, parallel processing applications. Pipelines Processing: An overlapped parallelism, Instruction and Arithmetic pipelines.

### Unit-II

Principles of designing pipelined processors, Internal forwarding and register tagging, Hazard detection and resolution, Job sequencing and collision prevention, Characteristics of vector processing, Multiple vector task dispatching, SIMD array processors, Masking and data routing.

### Unit-III

SIMD Interconnection network: Static, Dynamic networks, Cube interconnection network, Shuffle exchange and Omega Network, SIMD matrix multiplication, Multiprocessor Architecture: Tightly and loosely coupled multiprocessors.

### Unit-IV

Multiprocessor scheduling strategies and deterministic scheduling models, Introduction to Data Flow computing and data flow Graph, Introduction to 8 Bit and 16 Bit Intel Microprocessor Architecture and Register set.

### Unit-V

Assembly language programming based on Intel 8085; Instructions: Data Transfer, Arithmetic, Logic Branch operation, Looping Counting, Indexing, Programming Techniques, Counters and Time Delays, Stacks and Subroutines, Conditional call and Return Instructions, Advanced Subroutine Instructions.

## Reference

1. Hwang & Briggs, "Computer Architecture & Parallel Processing McGraw Hill
2. R.S. Gonkar "Microprocessor architecture Programming & Application with 8085: Pen Ram International
3. Peterson & Heresy, "Quantitative approach to computer architecture" Morgan Kaufman
4. Hwang, "Advanced Computing Architecture:", McGraw Hill
5. Quin "Parallel Computing, Theory and Practice McGraw Hill
6. Daniel Tabak, "Advanced Microprocessor" McGraw Hill
7. Hall D.V. "Microprocessor and Interfacing Program and hardware" TMH

## COMPUTER NETWORKS (MCA-301)

### Unit-I

**Introductory Concepts:** Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer transmission, switching methods, Integrated services digital networks, terminal handling.

### Unit-II

**Medium Access sub Layer:** Channel allocations, LAN protocols, ALOHA Protocols-Pure Aloha, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Linked Layer elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control

### Unit-III

**Network Layer:** Point-to Point networks, routing algorithms, congestion control algorithms, internetworking, TCP/IP packet, IP addresses, Ipv6

### Unit-IV

**Transport Layer:** Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.

### Unit-V

**Application Layer:** Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.

### References

1. A.S. Tanenbaum, "Computer Networks, 3<sup>rd</sup> Edition," PHI
2. W.Stallings, "Data and Computer Communication" Macmillan Press
3. Comer, "Internetworking with TCP/IP" PHI
4. Comer, "Computer networks & Inter" PHI
5. Forouzan, "Data Communication and Networking:.. TMH

## **DESIGN AND ANALYSIS OF ALGORITHM (MCA-302)**

### **Unit-I**

**Introduction:** Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences.

Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort

Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort

Medians and order statistics

### **Unit-II**

**Elementary Data Structure:** Stacks, Queues, Linked list, Binary Search Tree, Hash Table

**Advanced Data Structure:** Red Black Trees, Splay Trees, Augmenting Data Structure Binomial Heap, B-Tree, Fibonacci Heap, and Data structure for Disjoint Sets.

Union-find Algorithm, Dictionaries and priority Queues, mergeable heaps, concatenable queues

### **Unit-III**

Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis.

### **Unit-IV**

Graph Algorithms: Elementary Graph Algorithms, Breadth First search, Depth First search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

### **Unit-V**

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & the FFT, Number Theoretic Algorithms, Computational Geometry.

### **References**

1. Horowitz Sahani, "Fundamentals of Computer Algorithms." Galgotia
2. Coremen Leiserson etal, "Introduction to Algorithms", PHI
3. Brassard Brately, "Fundamental of Algorithms" PHI
4. M.T. Goodrich etal, "Algorithms Design" John Wiley
5. A.V. Aho etal. "The Design and analysis of Algorithms" Person Education

## **OPERATING SYSTEM (MCA-303)**

### **Unit-I**

**Introduction:** Definition and Types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

### **Unit-II**

**Process Management:** Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

### **Unit-III**

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

### **Unit-IV**

**Storage Management:** Memory Management-Logical and Physical Address Space Swapping, Contiguous Allocation, Paging Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page size and other considerations, Demand segmentation, File systems, secondary storage structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

### **Unit-V**

**Security & Case Study:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, Language based protection, The security problem, Authentication, One time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface Linux system-design principles, Kernel Modules, Process Management, Scheduling Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security.

### **References**

1. Abraham Siberschatz & Peter Baer Galving "Operating System Concepts"
2. Milan Milankovic, "Operating Systems, Concept & Design" McGraw Hill
3. Harvey M Ddeital "Operating System" Addison Wesley

## **DATABASE MANAGEMENT SYSTEM (MCA-304)**

### **Unit-I**

**Introduction:** An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DMI, Overall Database structure.

**Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

### **Unit-II**

**Relational Data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.

### Unit-III

Database Design & Normalization: Functional dependencies, normal forms, first, second third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

### Unit-II

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict and view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling .

### Unit-V

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation, Replication and allocation techniques for distributed system, over view of concurrency control and recovery in distrusted database.

### References

1. Date C.J. "An Introduction to Database System". Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts" McGraw Hill
3. Elmasri, Navathe, "Fundamentals of Database Systems" Addison Wesley
4. Paul Beynon Davis, "Database Systems" Palgrave Macmillan
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Pub.

## OBJECT ORIENTED SYSTEMS AND C++

### Unit-I

Object Modeling: Object & Classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, A Sample Object model, Multiple Inheritance, Meta Data, candidates keys, constraints.

### Unit-II

Dynamic Modeling: Events and states, Operations and methods, Nasted state Diagrams, Concurrency, relation of object and dynamic models, advance dynamic model concepts, a sample dynamic model.

### Unit-III

**Functional Modeling:** Functional Models, Data flow Diagrams, Specifying Operations, Constraints, a sample functional model.

### Unit-IV

**Programming in C++:** Classes and objects in C++, Functions, Constructors, Destructors, Inheritance, Functions overloading, Operator Overloading, I/O Real life applications, Extended classes, Pointer, Virtual functions, Polymorphisms, working with files, class templates, Function templates.

### Unit-V

Translating object oriented design into an implementation, OMT Methodologies, examples and case studies to demonstrate methodology, comparison of Methodology, SA/SD and JSD

### References

1. Rambaugh James etal, "Pbject Oriented Design and Modeling" PHI 1997
2. Bjarne Stroustrup "C++ Programming Language", Addison Wesley
3. Balagurusamy E, "Object Oriented Programming with C++" TMH-2001
4. Booch Grady, "Object Oriented Analysis and Design with application 3/e
5. Lipman, Stanley B Jonsce Lajole, "C++ Primer Reding" AWL, 1999
6. Dillon and Lee, "Object Oriented conceptual Modeling" New Delhi PHI-
7. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design"
8. Berzin Joseph, "Data Abstraction the object oriented approach using C++" McGraw Hill
9. Mercer, "Computing Fundamental with C++" Palgrave Macmillan

## COMPUTER BASED OPTIMIZATION TECHNIQUES (MCA-306)

### Unit

**Preliminaries:** Inventory Models and Replacement Problems: Inventory models – various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems capital equipment discounting cost replacement in anticipation of failure group replacement-stochastic nature underlying the failure phenomenon.

### Unit-II

**Linear Programming Problems (LPP):** Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

### Unit-III

**Integer Linear Programming Problems:** Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem.

**Transportation Problems:** Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution.

**Assignment Problems:** Definition, Hungarian Method for AP.

### Unit-IV

**Introduction to NLP:** Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Solfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Points etc

**Dynamic Programming:** Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem.

### Unit-V

**Queuing Theory:** Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions Markovian Process, Erlang Distribution, Symbols and Notations, Distribution of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

### References

1. Hadley, G. "Linear Programming and Massachusetts, Addison-Wesley
2. Taha, H.A. "Operations Research-An Introduction" Macmillian
3. Hiller, F.S., G.J. Lieberman "Introduction to Operations Research
4. Harvey M Wagner, "Principles of Operations Research with Applications to Managerial Decisions, Prentice Hall India Pvt. Ltd.
5. Swarup Ketal, "Operation Research" S.Chand

## **MANAGEMENT INFORMATION SYSTEM (MCA-401)**

**Unit-I: Foundation of Information Systems:** Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, effectiveness and efficiency criteria in information system.

**Unit-II: An Overview of Management Information Systems:** Definition of a Management information system, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing , Concept of an MIS, Structure of a Management Information Systems.

**Unit-III Concepts of Planning and Control:** Concept of organizational planning. The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization.

**Unit-IV: Business Applications of Information Technology:** Internet & electronic commerce, Internet, Extranet & Enterprises Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

**Enterprise of Managing Information Technology:** Enterprise & Global management, Security & Ethical challenges, Planning & Implementing changes.

**Advanced Concepts in Information Systems:** Enterprise Resource planning. Supply chain Management, Customer Relationship Management, and Procurement Management.

### **Text Books**

1. O. Brian, "Management Information System" TMH
2. Gordon B. Davis & Margrethe H. Oison, "Management Information System" TMH

### **Reference**

1. O Brian, "Introduction to Information Systems" McGraw Hill
2. Murdic, "Information System for Modern Management" PH
3. Jawadekar." Management Information Systme" TMH
4. Jain Sarika, :Information System System" TMH
5. Davis, "Information System" Palgrave Macmillian

## **MODELING AND SIMULATION (MCA-402)**

**UNIT-I** : System definition and components, stochastic activities, continuous and discrete, Systems, System modeling types of models, static and dynamic physical models, Static and dynamic mathematical models, Full corporate model, types of system study.

**UNIT-II**: System simulation, why to simulate and when to simulate, Basic nature of simulation, technique of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem single-server queuing system and an inventory problem, Monte Carlo simulation, Distributed Lag models, Cobweb model

**Unit-III**: Simulation of continuous system, analog vs. digital simulation, simulation of waster reservoir system, simulation of a servo system, simulation of an autopilot.

Discrete system Simulation, Fixed time-step vs. event-to-event model, generation of random numbers, Test for randomness, Generalization of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

**Unit-IV**: System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, System Dynamics diagrams, Feedback in Socio-Economic systems, world model.

**Unit-V**: Simulation of PERT networks, Critical path computation, uncertainties in Activity duration, Resource allocation and consideration. Simulation software, Simulation languages, continuous and discrete simulation languages, Expression based languages, object-oriented simulation, general-purpose vs. application-oriented simulation packages, CSMP-III, MODSIM-III

### **Reference**

1. Geofrey Gordon "System Simulation: PHI
2. Narsingh Deo, "System Simulation with digital computer" PHI
3. Averill M Law, W.David Kelton, "Simulation Modeling and Analysis" TMH

## **INTERNET & JAVA PROGRAMMING (MCA-403)**

**UNIT-1:Internet:** Internet, Connecting to Inter: Telephone, Cable Satellite connection, Choosing and ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

**Unit-II: Core Java:** Introduction Operator, Data Types, Variable, Arrays, Control statements, Methods & classes, Inheritance , Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout manager, Menus, Images, Graphics

**Unit-III: Java Swing:** Creating a swing applet and application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner Frame.

**JDBC:** The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database

**Unit-IV: Java Beans:** Application Builder tools, The bean developer kit (BDK). JAR files, Introspection, Developing a simple bean, using Bound properties. The Java Beans API, Session Beans, Entry Beans, Introduction to Enterprise Java beans (EJB),

Introduction to RMI (Remote Method Invocation): A simple client server application using RMI

**Unit-V: Java Servlets:** Servlet API basic, Life cycle of a servlet, Running Servlet, Debugging Servlets. Thread-safe servilets HTTP Redirects, Cookies, Introduction to Java Server pages (JSP)

### **References:**

1. Margarel Leving Young."The complete Reference Internet" TMH
2. Naughton, Schidt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA, TMH
4. Dustin R. Calway, "Inside Serviets" Addison Wesley
5. Mark Wutica, "Java Enterprise Edition" QUE
6. Steven Hoizner, "Java2 Black book" Dreamtech

## **COMPILER DESIGN (MCA404/(1))**

**Unit-I: Compiler Structure:** Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler

**Programming Language:** High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission.

Lexical Analysis: The role of Lexical Analyzer, A Simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer.

**Unit-II: The Syntactic Specification of Programming Languages:** CFG, Derivation and Parse tree, Ambiguity, Capabilities of EFG.

**Basic Parsing Techniques:** Top-Down parsers with backtracking, Recursive descent Parsers, Predictive Parser, Bottom-up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyzer Generator: YACC

**Unit-III: Intermediate Code Generation:** Different Intermediate forms: Three address code, Quadruples & Triples, Syntax Directed Translation mechanism and attributed definition.

Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

**Unit-IV: Run Time Memory Management:** Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management.

**Error Detection and Recovery:** Lexical phase errors. Syntactic phase errors, semantic errors.

**Unit-V: Code Optimization and Code Generation:** Local optimization, Peephole optimization, Basic blocks and flow Graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection.

### References

1. Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
2. A.V. Aho, R. Sethi and J.D.Ullman, "Compiler Principle, Tech & tools" AW
3. H.C. Holub "Compiler Design in C", Printice Hall Inc.
4. Apple, "Modern Computer Implementation in C: Basic Design" Cambridge Press

## **CRYPTOGRAPHY AND NETWORK SECURITY MCA-404(2)**

**Unit-I: Introduction of Cryptography:** Introduction To security: Attacks, Services & Mechanisms, Security, Attacks, Security Services, Conventional Encryption: Classical Techniques, Conventional Encryption Model, and steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operations.

**Unit-II: Conventional Encryption Algorithms:** Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, CR2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement of Encryption Function.

**Unit-III Public Key Encryption:** Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key, Key Management, Fermat's & Euler's Theorem, Primality, The Chinese Remainder Theorem.

**Unit-IV: Hash Functions:** Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function Birthday Attacks, Security of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signature, Authentication Protocol, Digital Signature Standard (DDS) Proof of Digital Signature Algorithm.

**Unit-V: Network & System Security:** Authentication Applications: Kerberos X-509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S/MIME Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

### **Text Book:**

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice hall, New Jersey

### **Reference Books:**

1. Johannes A. Buchmann, "Introduction to Cryptography" Springer-Verlag
2. Atul Kahate, "Cryptography and Network Security" TMH

## **DATA COMPRESSION (MCA-404/3)**

**Unit-I: Introduction:** Compression Techniques: Loss less compression, Loss Compression, Measures of performance, Modeling and coding.

**Mathematical Preliminaries for Loss less Compression:** A brief introduction to information theory: Models-Physical models probability models, Markov models, Composite source model, Coding? Uniquely decodable codes, Prefix codes.

**Unit-II: Huffman Coding:** The Huffman coding algorithm, minimum variance Huffman codes, Length of Huffman codes, extended Huffman codes, non binary Huffman codes, Adaptive Huffman codes: Update procedure, Encoding procedure, decoding procedure, Golomb codes, Rice codes, Tunstall codes, Application: Loss less image compression, Text compression and Audio compression.

**Unit-III: Arithmetic Coding:** Coding a sequence, generating a binary code, Comparison of Huffman and Arithmetic coding, Application: Bi-level image compression- The JBIG standard, JBIG2 Image compression, Dictionary Techniques-Introduction, Static Dictionary Diagram coding Adaptive dictionary: The LZ77 Approach, The LZ78 approach, Applications: File Compression-UNIX compress, Image compression- The Graphics interchange Format (GIF), Predictive coding: Prediction with partial match (PPM): The basic algorithms, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Sheeler Transform: Move-to-front coding CALIC, JPEG-LS, Multiresolution Approaches, Facsimile Encoding, Dynamic Markov Compression.

**Unit-IV** Mathematical Preliminaries for Lossy Coding:-Distortion criteria, Models, Scalar Quantization Problem, Uniform Quantization, Adaptive Quantization, Non uniform Quantization.

**Unit-V:** Vector Quantization: Advantages of vector Quantization over Scalar Quantization, The Linde-Buzo-Gray algorithm, Tree structured vector quantizers, Structured Vector Quantizers.

### **Text Book:**

1. Khalid Sayood: Introduction to Data Compression” Morgan Kaufmann, Publishing

### **Reference Book**

1. Ralf Steinmetz and Kalra Nahrstedt, :Multimedia computing and Communication and Applications” Printice Hall

## **CLIENT SERVER COMPUTING (MCA404/4)**

**Unit-I: Client/Server Computing:** DBMS concept and architecture, Single system image, Client server architecture, Mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

**Unit-II: Components of Client/Server Application:** The client services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & other services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).

The server Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

**Unit-III: Client/Server Network:** Connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system. Development: Software, Client-Server System Hardware, Network Acquisition, PC-level processing unit, Macintosh, Notebooks, pen, UNIX workstation x-terminals, server hardware.

**Unit-IV: Data Storage:** Magnetic disk, magnetic tape, CD-ROM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge Protectors.

Client Server Systems Development: Services and Support, System administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Desk, Remote Systems Management Security, LAN and Network Management issues.

**Unit-V: Client/Server System Development:** Training, Training advantages of GUI Application, System Administrator training. Database administrator training, End-user training. The future of client server Computing Enabling Technologies. The transformational System.

### **References:**

1. Patrick Smith & Steve Guengerich, "Client/Server Computing" PHI
2. Dawna Travis Dewire, "Client/Server Computing" TMH
3. Majumdar & Bhattacharya "Database management System" TMH
4. Korth, Silberchatz, Sundrashan "Database Concepts" McGraw Hill
5. Elmasri, Navathe, S.B. "Fundamentals of Data Base System" Addison Wesley

## **DATA MINING & WAREHOUSING (MCA-404/5)**

**Unit-I:** Dss-Uses, definition, Operational Database. Introduction to DATA Warehousing. Data-Mart, Concept of Data-Warehousing , Multi Dimensional Database Structures. Client/Server computing model & Data Warehousing. Parallel Processors & Cluster Systems. Distributed DBMS implementations.

**Unit-II:** DATA Warehousing: Data Warehousing Components. Building a Data Warehouse. Warehouse Database. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS. Schemas for Decision Support Data Extraction, Cleanup & Transformation Tools. Metadata.

**Unit-III:** Business Analysis Reporting & Query Tools & Applications. On line Analytical Processing (OLAP). Patterns & Models. Statistics Artificial Intelligence

**Unit-IV:** Knowledge Discovery, Data Mining. Introduction to Data-Mining Decision Trees Neural Networks. Nearest Neighbor & Clustering. Genetic Algorithms. Rule Introduction. Selecting & Using the Right Techniques.

**Unit-V:** Multimedia Data-Mining, Multimedia-Database, Mining Multimedia Data-Mining and the World Wide Web, Data-Mining, Mining and Meta-Data Data Visualization & Overall Perspective Data Visualization. Applications of Data-Mining.

### **References**

1. Berson, "Data Warehousing, Data-Mining & OLAP", TMH
2. Mallach, "Decision Support and Data Warehousing System" TMH
3. Bhavani Thrua-is-ingham, "Data-Mining Technologies, Techniques Tools" CRC Press
4. Navathe, "Fundamentals of Database System" Person Education
5. Margaret H. Dunham, "Data-Mining. Introductory & Advanced Topics" Person Education
6. Piter Adriaans, Dolf Zantinge. "Data-Mining", Person Education.

## **FOUNDATION OF E-COMMERCE (MCA-405)**

**Unit-I: Introduction:** Electronic Commerce – Technology and Prospects, Definition of E-Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-Commerce on business.

**Network Infrastructure of E-Commerce:** Internet and Intranet based E-Commerce-Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

**Unit-II: Mobile Commerce:** Introduction, Wireless Application Protocol, WAP Technology, Mobile Information device, Mobile Computing Applications.

**Unit-III: Web Security:** Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

**Unit-IV: Encryption:** Encryption techniques, Symmetric Encryption-Keys and data encryption standard, Triple encryption. Asymmetric encryption-Secret key encryption, public and private pair key encryption, Digital Signature, Virtual Private Network.

**Unit-V: Electronic Payments:** Overview, The SET protocol, payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking  
EDI Application in business, E-Commerce Law, Forms of Agreement, Govt. policies and Agenda.

### **References**

1. Ravi Kalakota, Andrew Winston, :Frontiers of Electronic Commerce” Addison Wesley
2. Bajaj and Nag. “E-Commerce the cutting edge of Business”. TMH
3. P. Loshin, John Vacca, “Electronic Commerce” Firewall Media, N.Delhi

## COMPUTER GRAPHICS AND ANIMATION (MCA-406)

**Unit-I: Graphics Primitives:** Display Devices: Refresh Cathode Ray Tube, Raster Scan Display, Plasma display, Liquid Crystal display Plotters, Printers.

Input Devices: Keyboard, Trackball, Joystick, Mouse, Light Pen, Tablet, and Digitizing Camera.

**Input Techniques:** Positioning techniques, Potentiometers, Constraints, Scales & Guidelines, Rubber-Band techniques, Dragging Dimensioning techniques and Graphical Potentiometers, Pointing and Selection: the use of selection points defining a boundary rectangle, multiple selections, Menu selection.

**Unit-II: Mathematics for Computer Graphics:** Point representation, Vector representation, Matrices and operations related to matrices, Vector addition and vector multiplication, Scalar product of two vectors, Vector product of two vectors.

**Line Drawing Algorithms:** DDA Algorithms, Bresenham's Line algorithm.

**Segment & Display files:** Segments, Functions for segmenting the display file, Posting and posting a segment, segment naming schemes, Default error conditions, Appending to segments, Refresh concurrent with reconstruction, Free storage allocation, Display file structure.

**Graphics Operations:** Clipping: Point Clipping, Line Clipping, Polygon Clipping.

Filling: Inside Tests, Flood fill algorithm, Boundary-Fill Algorithm and scan-line polygon fill algorithm

**Unit-III: Conics, Curves and Surfaces:** Quadric surfaces: Sphere, Ellipsoid, and Torus. Superquadrics: Superellipse, superellipsoid, Spline & Bezier Representations: Interpolation and approximation splines, parametric continuity conditions, Geometric Continuity Conditions, Spline specifications. Bezier curves and surfaces.

**Unit-IV: Transformation:** 2D transformation, Basic Transformations, Composite transformations: Reflection, Shearing, Transformation between coordinate systems.

**3D Graphics:** 3D Display Methods, 3D transformations, Parallel projection, Perspective projection, Visible lines and surfaces identification, Hidden surface removal.

**Unit-V: Animation:** Introduction to Animation to Animation, Principles of Animation, Types of Animation, Types of Animation Systems: Scripting, Procedural, Representational, Stochastic, etc.

**Animation Tools:** Hardware-SGI, PC's Amiga etc.

**Software:** Adobe Photoshop, Animation studio, Wave front etc.

**Gif Animator:** Microsoft GIF Animation, GIF construction, GIFmation etc.

**GKS:** GKS standards, GKS Primitives-Polyline, Polyline, Polymarker, and area, Text, GKS Workstation and Metafiles.

### **References:**

1. Donald Hearn and M Pauline Baker, "Computer Graphics" PHI
2. Steven Harrington, "Computer Graphics: A Programming Approach" TMH
3. Prajapati A.K. "Computer Graphics" PPM Ed2
4. Foley James D, "Computer Graphics" AW Ed2
5. Newman and Sprould, "Principle of Interactive Computer Graphics" McGraw Hill
6. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
7. Rogers and Adams, "Mathematical Elements of Computer Graphics " McGraw Hill

## **WEB TECHNOLOGY (MCA-501)**

**Unit-I:** History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics.

**Unit-II:** Communication Issues, the client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

**Unit-III: HTML:** Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.

**Java Script:** Introduction, Documents, Documents, forms, statements, functions, objects in Java Script, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

**Unit-IV: XML:** Introduction, Display and XML Documents, Data Interchange with an XML document, Document types definitions, Parsers using XML, Client-side usage, Server Side usage.

**Unit-V:** Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP)

### **Text Book**

1. Burdman, "Collaborative Web Development", Addison Wesley
2. Sharma & Sharma, "Developing E-Commerce Sites" Addison Wesley
3. Iva Bayross, "Web Technologies Part-II" BPB Publications

### **Reference**

1. Shishir Gundavarma, "CGI Programming on the World Wide Web" O'Reilly & Associate
2. DON Box, "Essential COM" Addison Wesley
3. Greg Buczek, "ASP Developer's Guide" TMH

## **MULTIMEDIA SYSTEM (MCA-502 (1))**

**Unit-I:** Evolution of Multimedia and its objects, Scope of multimedia in business & work, production and planning of Multimedia applications. Multimedia hardware, Memory of Storage Devices, Communication Devices, Multimedia Software, Presentation and object generation tools, Video, sound, Image capturing Authoring Tools, Card & Page Based Authoring Tools.

**Unit-II:** Production and Planning of Multimedia building blocks, Text, sound (MIDI), Digital Audio, Audio File Formats, MIDI under Windows environment, Audio & Video Capture.

**Unit-III:** Macromedia products, Basic drawing techniques, Advance animation techniques, Creating Multi layer combining interactivity and multiple scenes, Creating transparency effects using text in Flash, Flash animation.

**Unit-IV:** Digital Audio Concepts, Sampling variables, Loss Less compression, of sound, Lossy compression & Silence compression

**Unit-V:** Multimedia monitor bitmaps, Vector drawing , Lossy graphic compression, Image file formatic animations, Image standards, JPEG compression, Zig Zag coding.

Video representation, colors, video compression, MPEG standards, MHEG standard, recent development in multimedia. Multimedia Application Planning, Costing, Proposal preparation, and Financing-Case study of a typical industry.

### **References:**

1. Andreas Halzinger, "Multimedia Basics" Vol-I to VOL-III Firewall Media
2. Tay Vaughan, "Multimedia Making It work" Tata McGraw Hill
3. Buford, "Multimedia Systems" Addison Wesley
4. Agarwal and Tiwari, "Multimedia Systems" Excel
5. Rosch, "Multimedia Bible" Sams Publishing
6. Sleinreitz, "Multimedia Bible" Sams Publishing
7. Ken Milburn, John Ckroteau, "Flash 4 Web special Effects, Animation & Design Handbook" Dreamtech Press
8. John. Villamil-Casanova & Louis Molina, "Multimedia-Production, Planning & Delivery" PHI

## **DISTRIBUTED DATABASE SYSTEM (MCA-502(2))**

**Unit-I:** Introduction to Distributed Data System, Distributed Database Architecture, Distribution Data base Design, Transaction processing Concurrency Control techniques, Security.

**Unit-II:** Types of Data Fragmentations, Fragmentation and allocation of fragments, Distribution transparency, access primitives, integrity constraints.

**Unit-III:** Grouping and aggregate function, Query processing, Equivalence transformation of queries.

**Unit-IV:** Evaluation, parametric queries, Query optimization, Join and general queries.

**Unit-V:** Management of Distributed transaction and Concurrency Control: Distributed Data Base Administration, Catalogue Management Authorization, Security and protection. Examples of distributed database systems. Cost Analysis.

### **References:**

1. Ceri & Palgathi, "Distributed Database System" McGraw Hill
2. Raghu Rama Krishan and Johannes Gehrrib, "Ddatabase Management Systems" McGraw Hill
3. Date C.J. "An Introduction to Database System Vol I & II, Addition Wesley
4. Korth, Sibertz, Sudarshan, "Database Concepts" McGraw Hill
5. Elmasari, Navathe, "Fundamentals of Data Base System" Addition Wesley
6. Data C.J. " An Introduction to Database System" Addition Wesley
7. Rama Krishnan, Gehke, "Database Management System" McGraw Hill

## **ERP SYSTEMS (MCA-502(3))**

**Unit-I:** Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Mining and OLAP, ERP Drivers, Decision support system.

**Unit-II:** ERP Domain, ERP Benefits classification, Present global and Indian Market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use and Maintenance, Evolution and Retirement phases, ERP Modules.

**Unit-III:** Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP Customization, ERP-A manufacturing Perspective.

**Unit-IV:** critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation. Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

**Unit-V:** Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

### **References:**

1. A. Lexis Leon, "Enterprise Resource Planning" TMH
2. Brady, Manu, Wegner, "Enterprise Resource Planning", TMH

## **ADVANCED CONCEPTS IN DATABASE SYSTEMS (MCA-505(5))**

**Unit-I:** Query Processing, Optimization & Database Tuning:

Algorithms For Executing Query Operations. Heuristics For Query Optimizations, Estimations of Query Processing Cost, Join Strategies for Parallel Processors, Database Workloads' Tuning Decisions, DBMS Benchmarks, Catalogue in RDBMS:

**Unit-II:** Extended Relational Model & Object Oriented Database System:

New Data Types, User Defined Abstract Data Types, Structured Types, Object Identify, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model And Expert Database System.

**Unit-III:** Distributed Database System: Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing in R \* System, Concurrency Control in Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection and Resolution, Commit Protocols.

**Unit-IV:** Enhanced Data Model For Advanced Applications: Database Operating System, Introduction To Temporal Database Concepts, Spatial and Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues In real time Database Design.

**Unit-V:** Introduction to Expert Database and Fuzzy Database System:

**Expert Databases:** Use of Rules of Deduction in Databases, Recursive Rules

**Fuzzy Databases:** Fuzzy Set & Fuzzy Logic, Use of Fuzzy Techniques to Define Inexact and Incomplete Databases.

### **References:**

1. Majumdar & Bhattacharya, "Database Management System" TMH
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Varathe, "Fundamentals of Database Systems" Addison Wesley
4. Data C.J. "An Introduction to Database System" Addison Wesley
5. Ramakrishnan, Gehrke. "Database Management System", McGraw Hill
6. Bernstein, Hadzilacous, Goodman, "Concurrency Control & Recovery" Addison Wesley

## **NET FRA,EWPR L AMD C# (MCA-503)**

**Unit-I:** The .NET framework: Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classes.

**Unit-II:** C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.

**Unit-III:** C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.

**Unit-IV:** Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C# Localization.

**Unit-V:** Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C# Case Study (Messenger Application)

### **Text Books:**

1. Shibi Panikkar and Kumar Sanjeev, "C# with .NET Frame Work", Firewall Media
2. Shildt, "C#: The Complete Reference" TMH

### **Reference Books:**

1. Jeffrey Richter, "Applied Microsoft .Net Framework Programming",
2. Fergal Grimes, "Microsoft .Net for Programmers" (SPD)
3. Toney Baer, Jan D. Narkiewica, Kent Tegels, Chandu Thota, Neil Withlow, "Understanding the .Net Framework" (SPD)
4. Balagurusamy, "Programming with C#" TMH

## **SOFTWARE ENGINEERING (MCA-504)**

**Unit-I: Introduction:** Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

**Unit-II:** Software Requirement Specification: Analysis, Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of matrices and Measurement, Problem Analysis, Requirement specification, Monitoring and Control

**Software-Design:** Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Forth generation techniques, Functional independence, Software Architecture, Transaction and Transaction and Transform Mapping, Component level Design, Forth Generation Techniques.

**Unit-III: Coding:** Top-Down and Bottom-Up programming, structured programming, information hiding, programming style and internal documentation.

**Testing:** Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification and validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

**Unit-IV: Software Project Management:** The Management spectrum (The people, the product, the process, the project) Cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.

**Unit-V: Software Reliability & Quality Assurance:** Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.

**CASE (Computer Aided Software Engineering):** CASE and its scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

### **References**

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001
2. Jalote, Pankaj, "Software Engineering Ed.2" New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering" TMH
4. Ghezzi Carlo and Others "Fundamentals of Software Engineering" PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engg.
6. Sommerville, Ian, "Software Engineering" AWL
7. Fairly, "Software Engineering" New Delhi" TMH
8. Pfleger, S. "Software Engineering" Macmillan, 1987

## **ADVANCED COMPUTER NETWORKS (MCA-505(1))**

**Unit-I: Introduction:** Overview of computer network, seven-layer architecture, TCP/IP Suit of protocol, etc. Mac protocols for high speed LANS, MANs & WIRELESS LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet etc.). Fast access technologies, (For example, ADSL. Cable Modern etc.,

**Unit-II: Ipv6:** Why Ipv6, basic protocol, extension & option, support for QoS, Security, etc, neighbor discovery, auto-configuration, routing. Change to other protocols. Application programming interface for Ipv6, 6bone.

**Unit-III:** Mobility in network, Mobile, Security related issues  
IP Multicasting. Multicasting routing protocols, address assignments, session discovery, etc.

**Unit-IV:** TCP extensions for high-speed networks, transaction-oriented application, other new option in TCP

**Unit-V:** Network security at various layers, Secure-HTTP, SSI, ESP, Authentication header, Key distribution protocols, Digital signatures, digital certificates.

References:

1. W.R. Stevens, "TCP/IP illustrated, Volume1: The protocols" Addison Wesley 1994
2. G.R. Wright "TCP/IP illustrated, Volume 2: The implementation" Addison Wesley 1995

## **REAL TIME SYSTEM (MCA-505(2))**

Unit-I: Introduction to Real Time Systems, Priorities, Embedded Systems, Task, Classification & Requirements, Deadlines, Soft, Hard.

Unit-II: Firm Real Time Systems, Introduction to Real Time Operating Systems, Task Management, Inter Process Communication. Case Studies of Maruti II, HART OS, VRTX etc.

Unit-III: Characterizing Real Time Systems and Task Assignment & Scheduling Theory, Fixed and Dynamic Priority Scheduling Uniprocessor (RM and EDF), Multiprocessor (Utilization Balancing, Next-fit for RM & Bin-Packing Assignment for EDF Scheduling).

Unit-IV: Programming Languages and Tools Real Time Database Real Time Communication, FDDI, Specification and Verification using Duration Calculus, Flow Control, Protocols for Real Time (VTCSMS, Window, IEEE 802.3, IEEE 802.4, IEEE 802.5, Stop and Go Protocol, Media Access Protocol).

Unit-V: Fault, Fault Classes, Fault Tolerant Real time System, Clock Synchronization, Issues in Real Time Software Design.

### References

1. Krishna, C.M. "Real Time Systems", McGraw Hill
2. Jane W.S. Liu, "Real Time Systems" Person Education Asia
3. Levi and Agarwal, "Real Time Systems", McGraw Hill
4. Mathi & Joseph, "Real Time System: Specification, Validation & Analysis"  
PHI

## **PRINCIPLES OF USER INTERFACE DESIGN (MCA-505(3))**

**Unit-I: User-Interface:** Goals of User-Interface Design, Human factors in user interface design, Theories, Principles, and Guidelines, Goals of Systems Engineering, Accommodation of Human Diversity, Goals for Our Profession. High Level Theories, Object-Action Interface Model, Principle 1: Recognize the Diversity, Principle 2: Use the Eight Golden Rules of Interface Design, Principle 3: Prevent Errors, Guidelines for Data Display, Guidelines for Data Entry, Balance of automation and Human Control, Practitioner's Summary, Researcher's Agenda.

**Management Issues:** Introduction, Organizational: Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues, Expert Review, Usability, testing and Laboratories, Surveys, Acceptance tests, Evaluation During Active Use, Controlled Psychologically Oriented Experiments, Practitioner's Summary, Research's agenda.

**Unit II: Tools Environment, and Menus:** Introduction, Specification Methods; Interface-Building Tools, Evaluation and critiquing Tools Direct Manipulation and virtual Environments: Introduction, Examples of Direct manipulation systems, Explanations of Direct manipulation, Visual Thinking and Icons, Direct Manipulation Programming, Home Automation, Remote Direct manipulation, Virtual Environments Menus: Task-Related Organization, Item Presentation Sequence, Response Time and Display Rate, Fast, Movement through Menus, Menu Layout, From Fillin, Dialog boxes, Command-Organization strategies, The Benefits of Structure, Naming and Abbreviations, Command Menus, Natural Language in Computing, Practitioners Summary, Searcher's Agenda.

**Unit-III: Interaction Devices, Response Times, Styles and Manuals:** Interaction Devices, Introduction, Keyboards and Function Keys, Pointing Devices, Speech Recognition, Digitization, and Generation, Image and Video displays, Printers, Response Time and Display Rate: Theoretical; foundations, Exceptions and attitudes, User Productivity, variability, Presentation Styles and Manuals: Introduction, Error Messages, Nonathopomorphic Design, Color of Manuals, Help: Reading From paper versus from Displays, Preparation of Printed manuals, Preparation of Online Facilities, Practitioner's Summary, Researcher's Agenda.

**Unit-IV: Multiple-Windows, Computer-Supported Cooperative Work, Information's Search and www Multiple-Windows Strategies:** Introduction, Individual-Window Design, Multiple-window Design, Coordination by Tightly-Coupled Windows, Image Browsing and Tightly-Coupled Windows, Personal Role Management and Elastic Windows Computer-Supported Cooperative work: Introduction, Goals of Cooperation, Asynchronous Interactions; Different Time, Different Place, Synchronous Distributed: Different Place, Same Time, Face of Face: Same Place, Same Time, Applying CSCW to Education.

**Unit-V: Information Search and Visualization:** Introduction, Database Query and Phrase Search in Textual Documents, Multimedia Document Searches, Information Visualization, Advanced Filtering. Hypermedia and the World wide Web: Introduction, Hypertext and Hypermedia World Wide Web, Genres and Goals and Designers. Users and Their Tasks, Object Action Interface Model for Web Site Design, Practitioner's summary, Research's Agenda.

### **References:**

1. Ben Shneiderman. "Designing the User Interface" Addison-Wesley
2. Alan J Dix etal. "Human-Computer Interaction" PHI
3. Eberts, "User Interface Design"
4. Wilber O Galitx, "An Introduction to GUI Design Principles and Techniques" John-Wiley

## **MOBILE COMPUTING (MCA-505(4))**

**Unit-I:** Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.

**Unit-II: Data Management Issues:** Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multihopping, Adaptive Clustering for Mobile Network, Multicluster Architecture.

**Unit-III:** Location Management, Location Based Services, Automatically Locating Mobile Users, Locating and Organizing Services, Issues and Feature Directions, Mobile IP, Comparison of TCP and Wireless.

**Unit-IV:** Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research, Directions, Security Fault Tolerance for Mobile N/W.

**Unit-V:** What is Ad-hoc Network? Problems with Message Routing in Wireless Ad-hoc Mobile, Networks, Routing scheme based on signal strength, Dynamic State Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV).

### **Text Books & References:**

1. Shambhu Upadhyaya, Abhijeet Chaudhary, Kervin K wiat, Mark Weises, "Mobile Computing" Kluwer Academic Publishers
2. UWE Hansmann, Lothar Merk, Martin-S-Nickious, Thomas Stohe, "Principles of Mobile Computing" Springer International Edition.

## **NEURAL NETWORK (MCA-505(5))**

**Unit-I: Introduction:** Neural network, Human brain, biological and artificial Neurons, model of Neuron Knowledge representation, Artificial intelligence and Neural network, Network architecture, Basic Approach of the working of ANN – training, Learning and generalization.

**Unit-II: Supervised Learning:** Single – Layer networks, perception-linear separability, limitations of multi layer network architecture, back propagation algorithm (BPA) and other training algorithms, applications of adaptive multi-layer network architecture, recurrent network, feed-forward networks, radial-basis-function (RBF) networks.

**Unit-III: Unsupervised Learning:** Winner-takes-all networks, Hamming networks, maxnet, simple competitive learning vector-quantization, counter propagation network, adaptive resonance theory, Kohonen’s self organizing maps, principal component analysis.

**Unit-IV: Associated Models:** Hopfield networks, brain-in-a-box network, Boltzman machine.

**Unit-V: Optimization Methods:** Hopfield networks for-TSP, solution of simultaneous linear equations, Iterated gradient descent, simulated annealing, genetic algorithm.

### **Text Books:**

1. Simon Haykin, “Neural Networks – A Comprehensive Foundation. “Macmillan Publishing Co. New York 1994
2. K. Mahotra C.K. Mohan and Sanjay Ranka, “Elements of Artificial Neural Networks” MIY Press, 1997-Indian Reprint Penram International Publishing (India). 1997

### **Reference Books:**

1. A Cichocki and R. Unbehauen, “Neural Networks for optimization and Signal processing” John Wiley & Sons, 1993
2. J.M. Zurada, “Introduction to Artificial Neural networks” (Indian edition) Jaico Publishers, Mumbai 1997
3. Limin Fu “Neural Networks in Computer Intelligence” TMH.

## PROGRAMMING LAB (MCA-171)

- write C Program to find largest of three integers
- Write C Program to check whether the given string is palindrome or not
- Write C Program to find whether the given integer is
  - (i) A prime number
  - (ii) An Armstrong number.
- Write C Program for Pascal triangle
- Write C Program to find sum and average of n integer using linear array
- Write C Program to perform addition, multiplication, transpose on matrices
- Write C Program to find factorial of n by recursion using user-defined functions
- Write C program to perform following operations by using user defined functions
  - (i) Concatenation
  - (ii) Reverse
  - (iii) String Matching
- Write C Program to find sum of n terms of series  
 $n \cdot n^2/2! + n \cdot 3/3! - n \cdot 4/4! + \dots$
- Write C Program to interchange two values using
  - (i) Call by value
  - (ii) Call by reference.
- Write C program to sort the list of integers using dynamic memory allocation
- Write C program to display the mark sheet of a student using structure
- Write C Program to perform following operations on data files
  - (i) read from data file
  - (ii) Write to data file
- Write C program to copy the content of one file to another file using command line argument

## ORGANIZATION LAB (MCA-172).

- Study and Bread Board Realization of Logic Gates. K. Map, Flip-Flop equation, realization of characteristic and excitation table of various Flip Flops
- Implementation of Half Adder, Full Adder and Subtractor
- Implementation of Ripple Counters and Registrar
- Implementation of Decoder and Encoder circuits
- Implementation of Multiplexer and D-Multiplexer circuit

### **NUMERICAL TECHNIQUES LAB (MCA-172)**

- To implement floating point arithmetic operations i.e., addition, subtraction, multiplication and division
- To deduces errors involved in polynomial interpolation. Algebraic and trascendental equations using Bisection, Newton Raphson, Iterative, method of false position, rate of conversions of roots in tabular form for each of these methods.
- To implement formulae by Bessels, Newton, Strling, Languages etc
- To implement method of least square curve fitting
- Implement numerical differentiation
- Implement numerical integration using Simpson's 1/3 and 3/8 rules trapezoidal rule
- To show frequency chart, regression analysis, Linear square fit, and polynomial fit

Note: Institutions are required to add four more experiment as per available expertise with them

### **DATA STRUCTURE LAB (MCA-271)**

Write Program in C or C++ for following.

- Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort
- Searching programs: Linear Search Binary Search
- Array implementation of Stack, Queue, Circular Queue, Linked List
- Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation
- Implementation of Binary tree
- Program for Tree Traversals (preorder, inorder, postorder)
- Program for graph traversal (BFS, DFS)
- Program for minimum cost spanning tree, shortest path

### **UNIX/LINUX LAB (MCA-272)**

- Write Shell Script for UNIX environment
- Understanding of basic commands of UNIX administration, user authorization, grant of users right and privileges, backup and recovery
- Sources Code Control System understanding Lex and Yacc, debugger tools (Lint, make etc)
- Write program in C for Process Creation, Parent/Child process relationship, forking of process, Inter Process communication and socket programming implementation of exec system call, pipe, semaphore and message queue

### **MICROPROCESSOR LAB (MCA-273)**

- study of 8085 and 8086/8088 Kit
- Assembly Language programs for 8088 kit
  - (i) Address and data transfer
  - (ii) Addition, subtraction
  - (iii) Block transfer
  - (iv) Find greatest numbers
  - (v) Finr's and (r-1)'s complements of signed and unsigned number
- Assembly Language Programs for 8086/8088
  - (i) Multiplication of two decimal/binary/hexadecimal/octal numbers
  - (ii) Division of two decimal/binary/hexadecimal/octal numbers
  - (iii) Conversion of Lower case to upper case character.
- Test the performance of Booth's Algorithm for
  - (i) Signed numbers
  - (ii) Unsigned numbers.

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