

Master of Computer Application

Semester – Ist

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 111	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	4	0	4
2	MCA 112	INTRODUCTION TO INFORMATION TECHNOLOGY	4	0	4
3	MCA 113	COMPUTER PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE	3	2	4
4	MCA 114	COMPUTER ORGANIZATION	3	2	4
5	MCA 115	ACCOUNTING AND FINANCIAL MANAGEMENT	1	6	4

Semester – IInd

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 121	COMBINATORICS AND GRAPH THEORY	4	0	4
2	MCA 122	BUSINESS DATA PROCESSING	4	0	4
3	MCA 123	DATA STRUCTURE THROUGH 'C' LANGUAGE	3	2	4
4	MCA 124	COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES	3	2	4
5	MCA 125	SYSTEM ANALYSIS AND DESIGN	4	0	4

Semester – IIIrd

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 231	OPERATING SYSTEM	3	2	4
2	MCA 232	DATABASE MANAGEMENT	4	0	4
3	MCA 233	ANALYSIS AND DESIGN OF ALOGRITHMS	4	0	4
4	MCA 234	COMPUTER ARCHITECTURE	4	0	4
5	MCA 235	ELECTIVES	3	2	4

Semester – IVth

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 241	MANAGEMENT INFORMATION SYSTEM	4	0	4
2	MCA 242	DATABASE DESIGN	3	2	4
3	MCA 243	COMPUTER BASED OPTIMIZATION TECHNIQUES	3	2	4
4	MCA 244	OBJECT ORIENTED PROGRAMMING	4	0	4
5	MCA 245	ELECTIVES			

Semester – Vth

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 351	RELATIONAL DATABASE SYSTEM	4	0	4
2	MCA 352	CLIENT SERVER COMPUTING	4	0	4
3	MCA 353	SIMULATION AND MODELING	3	2	4
4	MCA 354	ELECTIVES	4	0	4

Semester – VIth

Sr.No.	Code	Name of Subject	L	P	U
1	MCA 361	Project/Seminar	4	0	4

Detailed Syllabus

MCA 1st Sem.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Prerequisite Nil

Sets, Relations and Functions: Definition of Sets and Subsets; Intersection, Union and Complements: deMorgan's law; Cardinality; Relations -Equivalence relations etc; Mappings - One-One, Onto etc.

Calculus: Functions, Limits and Continuity; Differentiation and Integration; differential Equations.

Logic: Logic operator like AND- OR etc.; truth tables; theory of Inference and Deduction; Mathematical Induction; Predicate calculus; Predicates and Quantifiers.

Linear Equations & Matrices : Row/Column operations; Gaussian Elimination; Decomposition; Inverse. Determinant: Properties of determinants; Cramer's Rule' Determinant, to transpose and inverse.

Vector Spaces: Linear independence; Bases, subspace and dimensionality.

Inner Products and Norms: Length, angle, direction cosines, Orthogonalizations.

Books:

1. Korthage, R.R. : Discrete Computational Structures, Academic Press, 1974.
2. Preparata F.P. : Yeh R-T : Introduction to Discrete Structure, Addison- Wisley, 1973.
3. Trembly JP. and Manohar R.P. : Discrete Mathematical Structure with Applications to Computer Science, McGraw Hill, 1975.
4. Lew: Computer Science: A Mathematical Introduction, Prentice Hall International, (CPaperback Edition)

102 INTRODUCTION TO INFORMATION TECHNOLOGY

Information Concepts and Processing: Definition, Need, Qualities, Value of information. Categories of information in business organization, level of information, data concepts, logical and physical concepts, data processing, elements of data processing system, word and text processing, graphics and office automation.

An Overview of Computer : Characteristics of computers, History of Computers, Generations of computers, Classification of computers, Applications of computers, Hardware & Software, Components of a computer System - CPU, Input/Output. Devices and Memory

types, Auxiliary storage devices.

Number systems: Binary numbers, octal number, hexadecimal number, Radix-decimal, octal, hexadecimal, conversion from one form to another, representation of decimal, octal, hexadecimal numbers fractional numbers and signed numbers, and 2's complement forms, Binary arithmetic addition, subtraction, Multiplication and division.

Codes: Various types -ASCII and 8 bit EBCDIC code conversion encoding and decoding.

System software: Foundations of system software, Distinction between systems software and Application software. Components of programming system-Evolution of Assemblers, loaders, linkers, compilers.

High Level Language: Different types of languages, Introduction to compilers and interpreter, Subroutine Library, Interpreters relative merits of compilers VS interpreters. Introduction to loaders and linkers and their types. Text editors; overview of editing process, user interface: editor structure.

Operating Systems: Evolution, introduction to OS functions and facilities, single tasking as, single user and multiuser as, characteristics of MS-DOS and Unix operating systems, commands, and utilities of MSDOS. Graphical User, Interfaces- Introduction to Windows, Word processing, spread sheet, database packages and its features. Introduction to Communication services - LAN, WAN, Internet facilities etc.

Books:

1. V Rajaraman : Fundamentals of Computers
2. VK. Jain: Computer Fundamentals
3. Sanders Donald H. , Computers Today, McGraw-Hill, 1998.
4. Ritchi: Operating System, BPB Publications.
5. Sanders Donald H. , Computer concepts and applications, McGraw-Hill, 1998.
6. Taxali R.K. PC Software made simple
7. D.M. Dhamdhere : Introduction to System Software, Tata McGraw -Hill, New Delhi, 1986.

103. COMPUTER PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

Algorithm development: Steps in programme development-Problem identification, task analysis, Data analysis, GIGO, outputs and Inputs, Pseudo codes, Algorithms, Flow Charting, Program coding, testing and debugging. Algorithms for searching (linear and binary), sorting (exchange insertion) merging of ordered lists.

Programming (Using C-Language) : Data types, variables and constants, expressions, operators and assignment statements, control statements, console I/O, Arrays, functions, Dynamic data structure in C-pointers, structures and Unions and user defined variables, File handling. The C preprocessor, C standard Library and Header files. Programming exercises.

Programming Techniques : Top down design bottom up design, Modular design and Structured programming.

Books:

1. Kernighan B.W & Ritchie D.M. The C Programming Language, Prentice Hall of India
2. Kenneth A., C Problem Solving & Programming. Prentice Hall International.
3. Jones, Robin & Stewart: The Art of C Programming.
4. N Wirth: Systematic Programming An- Introduction.
5. D Gries Programming Methodology
6. G. Dromey : How to solve it by Computer

104. COMPUTER ORGANIZATION

Overview of electronics: Stored program concept and Von Neumann architecture. Electronic components-Resistor, capacitor and Inductors, Semiconductor devices -Diodes, transistors (BJT and FET). Integrated circuits, Popular IC packages, Analog VS digital electronics, Transistor as a switch.

Boolean algebra and logic gates: Representation of values and complements. AND, OR, NOT operators, DeMorgan's theorem-simplifying expressions simple problems. Logic gates - Truth tables of AND, OR, NOT, XOR, XNOR, NAND, NOR gates, Combining logic circuits for expressions using NAND and NOR gates, Logic circuit families.

Combination and sequential Circuits : (Simple block diagrams, truth tables and IC packages only required) RS, JK, D and T flip flops, Master slave flip flops, counters- ripple and decade, Registers, latches and Tristate buffers.

Building blocks of a computer system: Basic building blocks I/O, Memory, ALU, Control and their interconnections, control unit and its functions- instruction set, Instruction and execution cycle, organizational sequence of operation of control registers: controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU its components.

Addressing techniques and registers: Addressing techniques-Direct immediate addressing; Paging, relative, indirect and indexed addressing, Memory buffer register; accumulators: Registers-Indexed, General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers.

Input-Output Organization: I/O devices (Video terminals and Printers). Programmed and Interrupt control mechanism, I/O controllers, Computer Buses, Interfacing buses, bus format & bandwidths.

Memory: Main, RAM, static and Dynamic, ROM, EPROM, EEPROM, Cache and Virtual memory, Auxiliary storage devices; hard disk, floppy disk, magnetic tape, cassette, cartridges and compact disks.

Microprocessors : Functional elements, introduction to 4 bit 8 bit, 16 bit, 32 bit microprocessors (Intel and Motorola), Architecture of 8086 microprocessor; Instructions of 8086, Memory interfacing, Interrupts and Interrupts controller, Timer and PIA for interfacing.

Books:

1. Mano Morris M : Computer System Architecture, PHI, 1993
2. Hayes IP : Computer Architecture and Organisation, McGraw-Hill, International Edition, 1988.
3. Tannenbaum A.S. : Structured Computer Organisation

4. Bartee T.c. : Digital Computer Fundamentals
5. Malvino & Leech: Computer Architecture

105 ACCOUNTING AND FINANCIAL MANAGEMENT

Preprerequisite : Nil

Accounting: Principles, concepts and conventions, double entry system of accounting, introduction of basic books of accounts of sole proprietary concern, closing of books of accounts and preparation of trial balance.

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

Financial Management: Meaning and role.

Ratio Analysis: Meaning, advantages, limitations, types of ratios and their usefulness.

Fund Flow Statement : Meaning of the terms-fund, flow and fund, working capital cycle, preparation and interpretation of the fund flow statement.

Costing: Nature, importance and basic principles.

Budget and Budgetary Control: Nature and scope, importance methods of finalisation of master budget and functional budgets Marginal Costing , Nature, scope and importance, Break even analysis, it's use and limitations, construction of break even chart, practical applications of marginal costing.

Standard Costing : Nature, scope. computation and analysis of variances with reference to material cost, Labour cost and overhead cost, interpretation of the variances.

Introduction to computerised 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.

Books:

1. Kellock J : Elements of Accountlnu. Heinemann. 1970.
2. Levy and Sarnat . Principles of Financial Management, Prentice Hall International.
3. Pandey J.M : Financial Management, Vikas Publications. 1979.
4. Horngren and Sundem. JntroduCiionto Financial Accounting Prentice Hall International.
5. Shukla & Aganval Advanced Accounting

MCA IInd Sem.

201 COMBINATORICS AND GRAPH THEORY

Prerequisite : Nil

Combinatorics : Permutations and Combinations; recurrence relations; Generating function, Decision Tables.

Graphs: Incidence and degree: Handling Lemma: Isomorphism; Subgraphs and Union of graphs; Connectedness Algorithm, Shortest path Algorithms; Eulerian graph; Fleury's algorithms and Chinese postman problem; Hamiltonian graphs-necessary conditions and sufficient conditions; Travelling salesman problem' Bipartite graphs.

Trees: Properties of trees; Pendant vertices in a tree; Center of a tree; Rooted and Binary trees; Spanning tree algorithms;

Fundamental circuits: Spanning trees of a weighted graph; cut sets and cut vertices;

Fundamental cut sets; connectivity and separability; Network flows; Max flow Min cut theorem.

Planar Graphs: Combinatorial and geometric duals; Kuratowski's graphs: detection of planarity; Thickness and crossing.

Matrix Representation of Graphs: Incidence; Adjacency matrices and their properties.

Colourings: Chromatic number; Chromatic polynomial; The six and five colour theorems: The four colour problem.

Directed Graphs: Binary relations: directed graphs and connectedness; directed trees, Arboricity: Polish method; Tournaments.

Counting of Labeled Trees: Cayley's theorem: Counting methods; Polya Theory

Books:

1. Harry F. : Graph Theory, Wiley Pub Co. 1972.

2. Trembley J P and Milllohar R.P : Discrete Mathematical Structures With Applications to Computer Science, McGraw Hill, 1975.

3. Deo N. . Graph Theory with Applications to Engineering and Computer Science, Prentice Hall Inc. 1974.

4. Krishnamurthy V : " Combinatorics Theory and Applications Affiliated East-West Press 1983.

202 BUSINESS DATA PROCESSING

Introduction to Data Processing: . Data Structure-Elements, fields, records and files. Data collection, Preparation, Verification, Editing and Checking.

Business Files : Records-fixed and variable lengths records: record layout; information of permanent and ;Semipermanent nature. Master file and Transaction files, file organization - Sequential,relative and Indexed file organization; file creation and handling, Addition and deletion of records, updation of Master file with help of transaction file(s),Processing Modes-

Batch and online processing with examples.. File and data security , Back ups and file recovery procedures.

COBOL: COBOL as a high level Business Data processing language, Character set, words, verbs and Data names - reserved words, sentence, paragraph, section, division, inbuilt documentation; Execution of COBOL programs, Evolution of different versions.

COBOL Syntax: Coding sheet, Development of simple program illustrating program structure and COBOL language, Compilation, Debugging, testing and Execution of COBOL programs.

Structured programming Objectives program development in modules, debugging and maintenance; program design Top down approach, HIPO flowcharts and pseudo codes.

COBOL implementation of structure programming; Basic control logic structure; coding standards, program organization modular development and subroutines, interlinking and nesting indenting and formatting,

Procedure function facilities for I/O operations. Table handling; Indexed tables SEARCH. Externally stored data manipulation, Sequential file processing; verbs and procedures for SORT, MERGE, SEARCH and ORDER. Direct access files Query facilities, Relative, random and Indexed sequential files. Report writer General format of a report COBOL features.

Business Data processing Organization: I/O Control ; access control, process control Passwords and other security aspects; job scheduling, Computer log. Documentation; Management of computer resources; centralized traditional Data Processing Department; Emerging Scene of distributed processing; Systems audit; Implementation of Data Processing Systems; Review of D.P service; Budgeting & Control of costs.

Books:

1. Philippakis & Kazmier : Information system through COBOL.
2. MM Lipschutz & S. Lipschutz: Theory & Problems of Data Processing.
3. M.K. Roy & Dastidar Ghosh: COBOL Programming.
4. Rajaraman V and sahasrabudhe H.V. : Computer Programming in CO-BOL , PHI.

203 DATA STRUCTURE THROUGH 'C' LANGUAGE

Basic Concept of Data Structure: Abstract and System defined Data Types, Data Object, Data abstraction: Notion of an algorithm. - Complexity measures: Rate of growth, basic time analysis of an algorithm ordering notion detailed timing analysis space complexity.

Arrays and their representation : Single and multidimensional arrays,address calculation using row and column major ordering. .

Stacks and Queues: Representation and Manipulation of Stacks and queues using Arrays, Uses of Stacks and Queues Recursion, circular Queues, Conversion from infix to postfix and

prefix expressions, Polish expressions. Pointers and their uses Continuous VS. Linked storage.
Linked Lists: Singly and doubly linked lists, Operations on lists, Circular linked lists, representation of sparse matrices using generalized list structure and polynomials representation using linked lists.

Storage Management and Garbage Collection: Memory allocation strategies, Dynamic storage management Reclamation and compaction Boundary Tag method.

Trees: Trees-Binary and N-ary trees, Representation of trees, Tree traversal algorithms. Threaded trees : In advantages, Conversion of general trees to Binary trees. B-trees Applications: Decision trees. Game trees and expression parsing

Symbol Tables: Decision tables -Static Symbol tables, Hash tables, Binary search tree, Dynamic Tree Tables.

Graphs and their Representation: Matrix representation, List structure, Graph traversal algorithm, application or graphs.

Strings and their Features: Strings Representation and manipulation using Arrays and lists, string Matching algorithms, Boyer Moore, Knuth Morris Pratt and Boyer Moore strategies.

Sorting and Searching: Sequential, Binary and hashed searching, internal and External sorting techniques, Bubble sort, insertion sort, Shell sort, Merge sort and Quick sort comparisons.

Books:

1. Aho A.V & Ullman J.E. : Data Structure & Algorithms.
2. Aron M. Tannenbaum & Others: Data Structures using C, Prentice Hall, 1992 ,
3. Mary E.S. Loomis: Data Management & File Structure, PHI, 1991.
4. Bhagat Singh & Thomas Naps: Introduction to Data Structure
5. Trembley & Sorenson: An Introduction to Data Structure with Application, McGraw-Hill, 1984.
6. Ellis Horowitz and Sartaj Sahani : Fundamentals of data structure with Pascal. Galgotia Book Source, 1994.

204 COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Prerequisite : Mathematical Foundation of Computer Science, Probability and Statistics.

(a) Numeric Computation:

Computer Arithmetic: Floating point numbers -- Operations, Normalizations and their consequences.

Iterative Methods: Zeros of single transcendental equations and zeros of polynomials using, Bisection, False position, Newton Raphson etc., convergence of solution.

Simultaneous Linear Equations: Linear equations solutions of simultaneous linear equations -Gauss elimination method and pivoting; Illconditioned equations and refinement of solutions, Gauss Seidel iterative method.

Numerical Differentiation and Integration Solution of Differential equation: Runge Kutta methods; Predictor-Corrector methods, Automatic error monitoring stability of

solutions..

Interpolations and Approximation: Polynomial interpolation Newton, Lagrange etc.
Difference tables. Approximation of function by Taylor series and Chebyshev polynomials

(b) Statistical Computation. :

Frequency charts: Different frequency charts. .

Regression Analysis : Least square fit; polynomial and curve fitting; Linear regression and Nonlinear regression Algorithms; Multiple regression Algorithms

Time Series and forecasting : Moving averages; Smoothing of curves: Forecasting models and methods;

Statistical Quality control Methods: Factor Analysis, ANOVA, Test of significance: X-test and F-test Applications to medicine, psychology, agriculture etc.

Books:

1. Stoer, Bullrich : Computer oriented numerical Methods, Springer Verlag, 1980.
2. Rajaraman V : Computer Oriented Numerical Methods, PHI, 1980.
3. Affi, A.A. : Statistical Analysis: A computer Oriented Approach, Academic Press Inc. 1978.
4. Krishnamurthy E. V. , Sen S. K. : Computer Based Numerical Algorithms, East-West Press 1984.
5. Scalzo, F.: Elementary computer Assisted Statistics, Van Nostrand Reinhold Co. Ltd. 1978.

205 SYSTEM ANALYSIS AND DESIGN

Prerequisite: Nil

Introduction: system Definition and concepts, characteristics and types of System, Real-life Business Subsystems, Systems Models, System Boundaries; Real-time and Distributed Systems, Basic principles of successful System.

Overview of system analysis and design, feasibility analysis, design, implementation, testing and evaluation- Introduction to Systems Development Life Cycle and its phases.

Project Selection: Sources of projects requests, managing project; review and selection, preliminary investigation.

Feasibility Study - Technical and economical feasibility, cost and benefit analysis.

System requirement specification and analysis: Fact finding techniques, data flow diagrams, data dictionaries, process organisation and interactions, Decision trees and tables.

Detailed design- Modularisation, Module specification, file design, system development involving data bases.

System control and Quality Assurance - Design objectives; reliability and maintenance, software design and documentation tools, topdown, bottom up and variants. Units and integration testing, testing practices and plans. System Controls, Audit trails and Security.

System Administration and Training, Conversion and operation plans.

Hardware and Software Selection, Hardware acquisition, memory, processes, peripherals,

benchmarking, vendor selection, software selection - Operating system languages, language processes, performance and acceptance criteria. .

Books:

1. James, A. S. : Analysis of Design of Information Systems, McGraw-Hill, 1986.
2. Awad Elias M. : System Analysis and design,
3. J. Ludeberg, M. Gilkuhi G. & Hilsson, A. : Information System Development. A Systematic Approach, Prentice Hall International, 1981.
4. Lee, B.S. : Introducing System Analysis and Design Vol 1 & 2, Manchester United Kingdom, National Computer Centre, 1978.
5. Davis W. S : System Analysis and design, Addison - Wesley, 1983.
6. Daniel: Practical System Design, Galgotia Publ. Pvt. Ltd.

MCA IIIrd Sem.

301 OPERATING SYSTEM

Prerequisite: Computer Organisation and Assembly Language Programming, System Software and C-Programming.

Introduction: Evolution of Operating systems, Types of Operating systems, Different views of the OS, Design and implementation of operating system.

Memory Management: Address protection, Single process monitor, Partitioned memory allocation static, partitioned memory allocation dynamic, segmentation. Virtual memory, paging., page replacement algorithms and cache memory.

Support for Concurrent Process: Mutual exclusion, Semaphores, queueing implementation of semaphores, Classical problems in concurrent programming, Critical regions.

Scheduling: Process concepts, systems programmer's view of processes, OS view of processes, OS services for process management, virtual processors, interrupt System mechanism, scheduling algorithms, implementation of concurrency primitive.

System deadlock: Prevention, detection and avoidance.

Multiprogramming system: Queue Management, I/O supervisors, memory management. File system, disk scheduling. Security mechanism, authentication, protection, access control and cryptography.

Multi Processor System: Multiprocessor interconnections, multi processor types, functions. disk scheduling. Security mechanism, authentication, protection, access control and cryptography.

Multi Processor System: Multiprocessor interconnections, Multiprocessor types, functions. Introduction to parallel computing, multiprocessor synchronization. Distributed operating systems - computer networks algorithms for distributed processing.

Books:

1. Peterson, James. L. and Silberschatz A. : Operating System, Addison-Wesley Publ. Comp., 1989.
2. Tanenbaum A. S. : Modern Operating System, PHI Pub!., 1995.
3. Bach, M.: Design of the UNIX operating System.
4. Melenkovic, Milan: Operating system -concept and Design, McGraw-Hill International Editions, 1992.
5. Deitel Harvey M.: An introduction to operating systems, Addison-Wesley Pub. Company, 1989.
6. Hansen Per Brinesh : Operating System Principles, PHI, 97178.
7. Madnick and Donovan: Operating System, McGraw-Hill Book co.

302 DATABASE MANAGEMENT SYSTEM

Prerequisites: Business Data Processing

Overview of Database Management: Basic Concepts, File-oriented approach versus database oriented approach to data management; Data independence, Database administration, DBMS users, data dictionary and Data models.

Introduction to Traditional Data Models: ANSI/SPARC 3-level architecture and the place of logical data models in this architecture, A brief overview of the three traditional models in this hierarchical model, network model and relational model, Data definition and data manipulation constructs.

Relational Model: Definition of relation; Storage organization for relations; Storage organization for relations, Fundamental integrity rules (entity, referential), Relational algebra, Tuple and Domain relational calculus and Relational query languages.

SQL: SQL constructs, Maintain and manipulation of relational data, VIEW definition and use, Temporary tables, Nested queries, SQL standards, Transaction processing and SQL, Integrity constraints; Embedded SQL and Application Programming Interfaces.

Database Design: ANSI/SPARC 3-level architecture, Entity Relationship model as a tool for conceptual design-entities attributes and relationships; ER diagram, Converting an E-R model logical (relational) model; update anomalies - Functional, multivalued, join dependencies; Normal forms (1NF, 2NF, 3NF, BCNF, 4NF, Domain -key Normal Form); Issues in physical design -Concepts of indexes, File organization for relational tables, and Denormalization.

Introductory Overview of Advanced DBMS Concepts: Database internal, Query processing, Concepts of transaction and transaction processing, database Concurrency and Recovery, Deadlocks, Database security, Introduction to Distributed databases.

DBMS Package:

Data types, create databases, modifying database structure, maintaining database. Sorting and Indexing databases; Query with menu and commands, Query and Reports, View, Formats and Labels. Programming: Creating command file, Memory variable, operators, Functions, Strings, File management and macros, managing multiple databases, Application programs. Input/Output statements, Looping and control structures,

Books:

1. Date, C.J.: An Introduction to Database Vol I &2, Addison-Wesley, 1981, 1983.
2. Korath H., Silberschatz A. : Database system Concepts, Second Edn., McGraw-Hill, 1991.
3. Ullman, Jeffrey D. :Principles of Database Systems, 2nd Edu., Galgotia Publ Pvt. Ltd. 1982.
4. Majumdar A. K., Bhattacharya P.: Database Management Systems; Tata McGraw-Hill, 1996.
5. Desai Vipin : An Introduction to Database systems, Galgotia Publ, 199 I.
6. DBMS Package Books: DBASE/Foxpro .
7. Pratt, P. : Database System Management and Design, Boyd and Fraser Publ. Comp., 1987.

303 ANALYSIS AND DESIGN OF ALGORITHMS

Prerequisite : Computer Programming and Problem Solving, Data and File Structure,

Review of basic data structures such as stacks, queues, linked lists trees and graphs.

Concepts in algorithm analysis. asymptotic complexity.

Domain independent algorithm design techniques such as divide and conquer greedy method, dynamic programming, backtracking, branch and bound techniques.

Example algorithms for above techniques from sets, graphs text processing internal and external sorting, height balanced trees, B-trees, hashing algorithms, dynamic storage allocation, garbage collection.

Lower bound theory and NP-hard problems.

Books:

1. Aho, A. V. Hopcroft, J.E., Ullman. J.D. : The Design and analysis of Computer Algorithms, Addison-Wesley Publishing Co., 1974.
2. Horowitz, E., Sahni, S. : Fundamentals of Computer Algorithms, Galgotia Publication, 1984.
3. Goodman, S.E. & Hedetniemi, : Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Company 1977.
4. Knuth, D.E. : Fundamental of Algorithms: The Art of computer Programming Vol. J, Narosa Publ. House, 1985.

304 COMPUTER ARCHITECTURE

Prerequisite: Computer Organisation, Operating System.

Introduction Organization of a simple processor and instruction set, concepts of Interrupt and I/O processor, Block data transfer and DMA. Processor vs memory speed.

Introduction and Classification of Parallel Computers. Pipelined and vector Processors - Instruction pipelining, Reservation table, Data and control hazards and methods to remove them. Some vector processors - STAR 100, CRAY-I, CYBER-205.

SIMD or Array Processors- Various interconnection networks, Data routing through various networks, Comparison of various networks. Parallel algorithms for matrix addition matrix transpose and matrix multiplication on SIMD computers with mesh, cube networks.

MIMD and Multi processor Systems - Uniform and non-uniform memory access multi processors, Scheduling in multi processor systems, Load balancing in multi processor systems. Parallel algorithms for matrix operations on multiprocessor systems.

PRAM model of Parallel Computing and Basic Algorithms -PRAM model and its variations, Relative powers of various PRAM models.

Parallel Algorithms for Multi processor systems - Basic constructs for representing PRAM algorithms, Parallel list ranking, Parallel algorithms for merging and sorting using linear array, mesh and cube.

Books: .

1. Hawang, K., Briggs, F. A. : Computer Architecture and Parallel Processing, McGraw Hill, 1985.
2. Hockney, R. w., Jesshope, C.R. : Parallel Computers :Architecture, programming and Algorithm, Adam Hilger, 1981.
3. Stone, H.S.& Others: Introduction to Computer Architecture, 2nd Edn., Galgotia Publ. Ltd. 1987.
4. Michael J Quinn: Parallel Computing -Theory and Practice, McGraw-Hill International Ed. 2nd ed, 1994.
5. Hawang, K.: Advance computer Architecture -Parallelism, Scalability and Programming, McGraw-Hill International Ed, 1993.

ELECTIVES

Group I

111 COMPUTER COMMUNICATION AND NETWORKS

Data Communication: Data Communication System, Communication channels, synchronous and asynchronous data transmission. Analog and Digital data; Analog Modulations (AM, FM, PM); Digitizing (PCM, DPCM, DM); Digital Modulation and Demodulation; Transmission Media; Transmission Error detection and Correction. Transmission Media; Transmission Error detection and Correction. Data Encoding; Multiplexing Frequency Division Multiplexing, Time Division Multiplexing.

Networks: Network goal and their applications: OSI Reference Model for Computer Networks - Layer structure and protocol architecture.

Switching Mechanism: Data Switching Circuit, Message and Packet Switching, Space and

Time Division Switching; Data Link Protocols - Simplex stop and wait, Sliding Window Protocol, X. 25/HDLC protocol at Data Link Layer. Routing and Congestion Control - Virtual Circuits and Data grams services; Routing Techniques; Congestion Control; Deadlocks; Network Control Protocol of well known network.

Broadcast Wide Area Networks - Satellite and packet radio network Local Networks (Topologies, Protocols, Fibre-optic network, Bridges)-Virtual protocol; Transport and Session services; Interconnection of packet switched network; Application Protocols - E-Mail, FTAM; Data compression techniques; Data Security and privacy

Reference Books:

1. Michael A, Miller: Introduction to Digital and Data Communications JAICO Publishing.
2. Martin James: Telecommunications and the Computer, prentice-Hall.
3. William Stallings, "Data and Computer Communications." Prentice-Hall India, (4th Edition)
4. AS. Tanenbaum, "Computer Networks" Prentice-Hall, India (2nd Edition)
5. Black U, "Data Communications and Distributed Networks" Prentice-Hall India.
6. Vijay Ahuja, "Design and Analysis of Computer Communications Networks" McGraw-Hill (International Student Edition)

112 MICROPROCESSOR AND APPLICATIONS

Microcomputer structure (Processor, memory and I/O, Bit slices and 8/16/32-bit microprocessors); Microprocessor architecture (registers, index and stack pointers, addressing modes); I/O interface adapters (parallel and serial), interface devices, system clock, clock phase and bit rates; Memory read-write and read only, memory mapping of I/O; Interrupts, types, handling of interrupts, polling and vectored interrupts; Direct memory access methodologies. .

Software development and debugging aids.

Microprocessor based real-time control and instrumentation system.

Books:

1. Khambata, J.: Microprocessor and Microcomputer, John Wiley and Sons, 1995.
2. Liu, Y, Gibson, G.A. : Microcomputer systems: The 8086/8088 family, Prentice-Hall, 2nd Edn. 1986.
3. Parson, A.J. : Microprocessors: Essential, Components and System, Galgotia Publ. Pvt. Ltd.
4. Aspinall: Microprocessors and its applications, Galgotia Publ. Pvt. Ltd.
5. Gaonkar: Microprocessor and its Applications.

113 VISUAL BASIC

Introduction : Need of Visual languages, Integrated Development Environment (IDE), Advantages of Visual BASIC, Characteristics and features of Visual BASIC - IDE, Projects, User Interface, Objects Oriented, Visual Development and. Event-Driven Programming,

Forms/Graphic controls, Data processing with windows and Internet applications.

Visual BASIC Programming and Tools: An Introduction of Visual BASIC Programming, Simple program Construction, Statements, Input/Outputs, Preprocessors, Comments, Editor, Codes. Variables, Constants and Data types, Arrays, Collections, Procedures, Arguments, Functions, Subroutines, Control Flow Statements, Loop Statements, Objects, and variants. Visual BASIC debugging, tools. Runtime errors handling,

Designing User Interface - Elements of User Interface, Understanding Forms, Menus and Toolbars, Designing Menus and Tool-bars, Building Dynamic Forms, Drag and Drop Operations, working with menus, customizing the toolbars

ActiveX Controls - TextBox, ComboBox, ScrollBar and Slider Controls operations, Generating Time Events, Drawing with Visual Basic using Graphics Controls, Coordinate systems and Graphic methods. Manipulating Colours and pixels with Visual Basic. Operations with Common Dialogs Control. TreeView and ListView Controls.

Object Oriented Programming - Create Objects and Classes, Creating special properties of classes, Enhancing the simple and object classes, collections working with objects and collections. Recursive programming- Binary Search, Scanning folders and Building custom explorer, Creating Printed Outputs Using the printer object and reports. Integrating with Microsoft windows and office 97, Concepts Automation, ActiveX and object models, Automation with word 97, Excel 97.

Database Programming with Visual Basic - Data Access methods, Creating, reading and writing text files- Data controls creating Queries.

References Books:

1. Petroustos Evangelous; Mastering Visual Basic; BPB Publications; 1998.
2. Norton's Peter : Guide to Visual Basic; Techmedia; 1998.
3. Kurata Deborah: Doing Objects in Visual Basic; Techmedia; 1998.

MCA IVth Sem.

401 MANAGEMENT INFORMATION SYSTEM

Introduction to MIS: Meaning and role of MIS, Definition of MIS, Systems approach to MIS, MIS organization within a company. Concept of balanced MIS, effectiveness and efficiency criteria.

MIS Planning: MIS structure and components, MIS features, Problem and Derivation of MIS plans, Prioritisation and developmental strategies.

Conceptual Design of MIS: Definition of the problem, System objectives and system

constraints. Analysis of information Source, alternative system design and selection of optimal system. Conceptual system design document.

Detailed System Design and Implementation: Application of basic system design concepts to MIS, Involvement of end-user and role of MIS department and System Analyst, Role of Top Management during design and implementation. System evaluation review and update. Management and control of MIS function. Advanced MIS concept, Decision Support System. Pitfalls in MIS development. .

MIS in Operation: (see not at end): MIS for Accounting and Finance Function, MIS for Personnel Systems, MIS for Accounting and Finance Function, MIS for Personnel Systems, for Marketing Systems, Production & Inventory system.

Note: A Standard layout is to be adopted for all MIS:

(1) Key Information Needs.

(2) Transaction Processing and Management Control.

(3) Reports Design and Data Collection Methods routing, frequency; Input, Output and Control Reports .

(4) Computer System Design -Master and Transaction files, Checks & Control Reports.

Books:

1. Murdick R. G., Ross JE. & Claggett J.R. : Information system for Modern Management, 3rd Edn., PHI, 1997.
2. James A.O Brien: Management Information Systems, Galgotia Pubn., 1994.
3. Wigarders K, Svensson A., Sehong L. : Structured Analysis & Design of Information Systems, McGraw-Hill book Co. 1986.
4. Locus: Analysis, Design and Implementation of Information system, 3rd Edn., McGraw-Hill Book Co.
5. Jawedker: Information System for Management.
6. Anderson Lavid L., Post Gerald V. : Management Information System; Tat McGrawhill, 3rd, 1999.

402 DATABASE DESIGN

Prerequisite: Data Base Management System

Physical Database Design: Determinants of database performance, representation of tables using operating system files, single table files, multitable files and table fragmentation clustered table organization, typical page organization, Indexing, B-tree, B-tree organizations, ISAM organization; clustered and non-clustered indexes, hashing, static and dynamic hashing, buffer management.

Query Processing: Query processing stages, query interpretation equivalence of expressions, query resource utilization, query execution statistics, query execution plan, estimation of query processing cost, table scans, sample index access, fill factor, multiple table (merge join, multiple table join); structure of a query optimizer,

Transaction Processing: Definition of transaction, desirable properties of transaction schedules and recoverability serializability of schedules, level transaction consistency

deadlocks nested transaction long duration transactions, transaction performance, transaction bench marking,

Crach Recovery and Concurrency control: Failure classification, recovery concepts, recovery concepts based ondeferred update, recovery concepts based on immediate update, shadow paging, check points, on-line backup during database updates. Concurrency Control-Locking techniques based on time-stamp ordering, multi-version techniques, optimistic techniques, multiple granularity.

Distributed Databases: Distributed databases concepts, types of distribution, architecture of distributed databases, design of distributed databases, distributed query processing, recovery in distributed systems, commit protocols for distributed databases.

Integrity, Security and Repositories: Need for database intergity constraints, non-procedural integrity constraints, interity constraints specifications in SQL, introduction to database security issues, authorization and use, views, as security mechanism, security specification in SQL, system catalogs.

Emerging Database Trends: Introduction Client-server databases, object-oriented databases, active databases, deductive databases concepts of next generation databases, data warehouses and multi-media databases.Design and database Administration skills on near-real-life applications in a commercial RDBMS packages like, Ingres,Oracle or Sybase.

Books:

1. Korath H., Silberschatz A. : Database System concepts, Second Edn., McGraw-Hill, 1991.'
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2. Fundamentals of Database Systems (Second Edition) ; R. Elmasri; S. Navathe; Benjamin Cummings, 1994.
3. Ullman, Jeffrey D.: PrinCiples of Database Systems, 2nd Edn., Galgotia publ. Pvt. Ltd., 1982.
4. Majumdar A.K, BhattacharyaP.: Database Management System; Tata McGraw-Hill, 1996.
5. Desai Vipin : An Introduction to DatabaseSystems,Galgotia Publ.,1991.
6. Fadden F. M. : Hoffer I;Benjamin C.: Modern Database Management (IV Edition); Narosa Pub.; 1994.
7. Pratt, P : Database System Management and Design, Boyd and Fraser Publ.,1987.
8. Date. C.J. : An Introduction to Database Systems Vol I & 2, Addison-Wesley, 1981-1983.

403 COMPUTER BASED OPTIMIZATION TECHNIQUES

Linear Programming: LP formulations, Graphical inethod for solving LPs with 2 variables. simplex I.nethod,quality theory, Special Linear Programming problems -Transportatlons problem (North-west-comer, Leastcost & vogel approximation methods), Assignment problem (Hungarian Method), Transshipment model.

NetworkAnalysis: Examples of network flow problems, Shortest route problems -Dijkstras Alogorithm, Applications of shorttestroute problems. Max flow problem - Flow network, Lebellng routine and algorithm, Mincut and max-cut and max-flow min-cut theorem.

Project Scheduling by PERTICPM : Project management Origin and use of PERT origin and use of CPM, Applications of PERT and CPM. Project network - Diagram representation,

Critical path calculations by linear programs, Critical path calculations by network analysis and critical path method (CPM), Construction of Gantt chart and resource labelling, program Evaluation and Review Technique (PERT).

Dynamic Programming: Basic concepts, Bellman's optimality principles, of D.P. models and computations. Examples of allocation, replacements, networks, sequencing and scheduling.

Queueing Models: Notations and assumptions, Queueing models with poisson input and exponential services - Birth-death queueing models, Single service counter and arrivals through multiple channels, poisson arrival & Erlang service distribution.

Sequencing Models: Sequencing problem, Johnson's Algorithm for processing jobs through TWO and THREE machines, Processing 2 jobs through n machines.

Inventory Models: Introduction to the inventory problem, Deterministic Models - The classical EOQ (Economic Order Quantity) Model, Nonzero lead time, The EOQ with shortages allowed.

Books:

1. Gillet B.E. : Introduction to Operation Research -A computer oriented Algorithmic Approach, Tata McGraw-Hill Pub. Co., New Delhi.
2. Taha Hatndy,A : Operation Research -An Introduction, Fifth Edn., PHI, New Delhi.
3. Mital K. V. and Mohan C. : optimization Methods in .operations Research and Systems Analysis, 3rd Edn, New Age International Pub- Iishers, New Delhi.
- 4, Hiller, F.S. & Limerman, G. 1. : Introduction to Operations Research, 2nd Edn., holden Day Inc., London, 1974.
5. Sharma S.D. Operation Research; Kedar Nath R.& Com' Meeruth' 12th Ed, 1998.
6. Kapoor VK. : Operation Research; Sultan Chand & sons' Fifth Edition 1999.

404 OBJECT ORIENTED PROGRAMMING

An Overview of Object Oriented Programming:

The need of object oriented programming, Procedural vis object oriented approach, Advantages of object oriented programming. Characteristics of object oriented languages - Objects, Classes, Inheritance, Active data, Message passing.

Object Oriented Programming Tools and c++ :

An Overview of c++ Programming, simple program Construction Functions, Statements, Inputs/Outputs, Preprocessors, Comments, Variable; and Manipulators, data types, type Conversions, Library functions.

Operators, Loops and Decisions statements. Structures, Structures within structures, Structures and classes, Enumerated data types.

Functions: Functions declaration, calling, Passing arguments to functions & Returning values from functions, Reference arguments, Over loaded functions, Variable and storage classes.

Objects and Classes: Classes and objects, c++ Objects and memory

Arrays: Defining arrays. Multidimensional arrays, Passing arrays to functions, Arrays of structures, Arrays as class members data, Arrays of objects, Arrays of strings.

Operator Overloading: Overloading unary, binary and arithmetic operators, Adding polar

coordinates, Concatenating strings, Multiple over loading, Pitfalls of operator over loading and conversion.

Inheritance: Derived class and base class, Overriding member functions, class hierarchy, Public & private inheritance, Levels of inheritance, Multiple inheritance.

Pointers: Addresses and pointers, pointer & arrays, pointer & functions, use of pointers in strings, linked lists & memory management, and pointers to objects.

Files and Streams : Streams, strings and objects I/O, I/O with multiple objects. File operations using pointers. ,

c++ Class library, Multifile programs Graphics and virtual functions.

Applications: Object Oriented Programming in Simulation and AI; Programming Environments.

Books:

1. Robert Lafore : Object Oriented Prbgramming in c++; Galgotia Publication.
2. Margaret Ellis; Bjarne Strousstrup : The annotated c++ reference manual.
3. Stephen Prata ; c++ Primer Plus; galgotiapub.
4. Chirlian PM. : Programming inc++; Merril pub. Co.,1990.
5. Witt K,V : An Introduction to the OOP; Galgotia.

ELECTIVES

Group II

211 COMPUTER CENTRE MANAGEMENT

Prerequisite: All core courses of Computer Science and Enginer.

Administration of the centred: Overview of the industry and man- power levels; Duties and resonsibilities of the computer centre director; Location of the centre in the organizational structure; Internal organiation of the centre; computer secnrity; Priority and pricing policies; Differences between business research and ucional computing centres.

Personnel: the computer-centre managers; classification of computen centre personnel,Salaries by job classification; Recruiting techniques, Psychology and productivity of programmers; Importance of quality control.

Hardware; Trends in cost performance;Optimum computer acquisition cycle: Arguments for centralized versus decentralized facilities; Lease versus purchase decisions: Contactual aspect of equipements acquisoition.

Computer Selection and Performance Evaluation: Computer selection techniques: Performance measurement using monitors and simulators: Performance prediction using, simulators and analytical models; Scheduling algorithms

Balancing personnel and Hardware: Effect of installation mission on personnel level and personnel types; personnel level versus monthly hardware rental costs: Effect of computer availabilityon total costs; Mathematical model relatling personnel, hardware size, and installation mission; Rccruting. implications of hardware-personnel balance

Software Evalution and Selection: Factors affecting makeor-buy decslion on software,Unhundling, and its effect on software procurement; contractual aspects of purchasing software;Selcting appropriate languages and services; cost of program conversion; Mathematical model for the programming-conversion decision. .

Books:

1. Chandor, A. : Choosing and Keeping Computer Staff, Allen & Unwin, 1976.
2. Joslin, E. O. : Computer Selection, Technology Press, 1977.
3. Banarjee, Utpal : Computer Management and Planning, Tata McGraw- Hill, 1985.
4. Cortada, I.W. : Managing D.P. Hardware, Capacity Planning, Cost justification, Availability and energy management, 1983.
5. Newbrough, ET. and Others: Effective Maintenance Management, McGraw-Hill Book Co. 1967.
6. Ravindranath B. : Computer centre Management - Classic Publ. House, 1993.

212 ORGANISATIONAL STRUCTURE AND PERSONNEL MANAGEMENT

ORGANISATIONAL STRUCTURE:

Organisation Theories - Classical, Neoclassical, System and Contingency theory - Principles of organisation, Formal and informal organisation.

Organisation Structure - Environment and Structure, Mechanistic vs Organic structure; Organisation size and structure; Impact of technology on organisation structure.

Design of organisational structure - Departmentation; Basis of departmentation, Span of management; Delegation of authority; Centralisation and decentralisation; Factors determining decentralisation.

Forms of Structure - Line & staff structure; Divisional structure; Project structure and Matrix structure.

PERSONNEL MANAGEMENT

Personnel Management: Personnel Function : Its evolution, objectives, principles, philosophies and policies, duties and responsibilities of the Personnel Manager; position of the Personnel Department in the Organisation; Line & Staff Relationship and the changing concept of Personnel Management in India.

Manpower Planning: Its uses and benefits: Problems and limitations; manpower inventory; manpower forecasting, job descriptions; manpower skills analysis and practices in the India Industry.

Recruitment: Job specification, selection process, psychological testing techniques, interviewing techniques, transfers, promotion and its policies; induction placement and exit interview.

Training and Development: Its objectives and policies planning and organising the Training Department; Training Manager and his job; on and off the Job training, techniques, career planning-objective of performance appraisal and its methods.

Books:

1. Prasad, L.M. : Principles and Practice of Management; Sultan Chand & Sons.
2. Shslekar, S.A. & Shslekar Y. : Mods, Business Organisation and Management: Himalayam Publications.

3. Monappa A. & Saiyadain M.S : Personnel Management, 5th Reprint, Tata McGraw-Hill, 1979.
4. Rudrabasavaraj M.N. : Dynamic Personnel Administration, 2nd edn. Himalays Publishing House Bombay, 1979.
5. Torrington and Hall, : Personnel Management: A new approach, Prentice-Hall International (Paperback Education)
6. Flippo, E.B. : Personnel Management.

213 COMPUTER ASSISTED MANAGEMENT CONCEPTS

Prerequisite: Accounting & Financial Management, Organisational Structure and Personnel Management, Business Data Processing.

Study of Management Processes - Planning, Organisation, Directing, Communication, Controlling and Coordinating.

Study of Decision - making process, utility theory and utility functions, decision making under uncertainty and risk, Quantitative techniques for decision making; Discriminant Analysis. Cluster Analysis, Factor analysis, technological forecasting for business decisions. Information System for management and decision making.

Computer applications in different functional management areas viz. Financial management, material management, production management, marketing, planning etc.

Books:

1. Birkle, J. & Yearsley, R. : Computer Application in Management, Staples Press, London. 1969.
2. Massie, I.L. and others: Essentials of Management 4th edn., Prentice-Hall India, Ltd. New Delhi-1987.
3. Higgins, I.C. : Computer Based Planning System, Edward Arnold (Publ) Ltd. London, 1985.
4. Morris, W.T : Decision Analysis, Gird Publ - 1977.
5. Tummala, V.M. : Decision Analysis with business applications, Intext Education Publ. 1973.

214 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS

Prerequisite : Probability and Statistics, Computer Based Numerical and Statistical Technique, Operating System.

Review of Hardware and Software Configuration: Processing units; I/O channels and control units; Memory structure and organization, Modes of computer system operations- batch, time sharing. multi-programming and multiprocessing; objectives of various configurations; Defining performance criteria; workload analysis and simulation; Hardware monitoring system; system performance tuning.

Stochastic and Probability Models of Computer Systems: Network models, model-

building through operational analysis; Occurrence of saturation phenomena; Comparison of various modelling approaches.

Reliability and Availability of Computer Systems: Series, parallel and network systems; fault rates and failure probabilities.

Software system Performance Modelling: Modelling of programs; Network models of computer programs; software monitoring systems.

Software Reliability Reliability Models: Estimation, measurement and prediction models.

Books:

1. Ferrari D. Computer Systems Performance evaluation, Prentice Hall, 1978.
2. Hellerman H., Couroy T Computer System Performance, McGraw- Hill, 1975. "
3. Kobayashi H. : Modelling and Analysis. An Introduction to System Performance Evaluation Methodology, Reading Mass., Addison-Wesley, 1978.

MCA Vth Sem.

501 RELATIONAL DATABASE SYSTEM

Prerequisite : DBMS, Database Design

Oracle Products Overview: Introduction to Oracle, Oracle server features, 4GL Tools, Oracle Users, Environment and Applications. Database Structure, Data dictionary and Data Access. Database Management Through SQL and SQL*Plus: Evolution of SQL, SQL standards and conventions: Tutorial applications and online help, Overview of SQL*Plus; Basic SQL operations" Defining Tables, Data maintenance, Data retrieval, Using views, SQL*Forms" Querying database.

Data Types and Operators, Standard Functions, Format models, Hierarchical Queries, Indexing tables, Formatting Query Results, SQL*Reportwriter and its features. Oracle Utilities - EXP, IMP, ODL and SQL *Loader.

Advanced Oracle Server Concepts Concepts of Data Integrity, Transaction Controls, Data Concurrency and Consistency, Database Security. Maintaining Data Integrity - Integrity Constraints, Database Triggers; Controlling Transactions; Database Security - Planning, Resource managing, Adding/dropping Users, Privileges and roles. .

Using PL/SQL : Structure of PL/SQL Blocks, variables, Control structures, Subprograms- Procedures and manipulation of procedures, Packages and operations on packages; Dependency Issues.

Books

1. James T. Perry, Joseph Lateer : Understanding Oracle; BPB Publ., 1992
2. Corey: Oracle Data Warehousing; Tata McGraw Hill.

3. Koch: Oracle 8 : Completa Reference; Tata McGrow Hill.
4. Developing Client/Server Applications with ORACLEDeveloper/2000; Technomendia Publications.
5. Mastering: Oracle 8 Client/Server Computing; 2nd Edn, BPB Publ.
6. Urman: Oracle * : PL/SQL Programming; Tata McGrow Hill.

502 CLIENT SERVER COMPUTING

Client/Server Computing: Evolution of Client / Server concept, Definition, History, Need and motivation for Client/Server approach, Client/ Server environments, characterization of Client / Server computing, CIS Types and Examples, Functions of clients and functions of servers.

Architecture: Components of client-server architecture, application partitioning, the two-layer and three-layer architectures, communication between clients and servers, use of a APIs in client/server computing, middleware technology in client/ server computing.

Transaction Processing (TP) Monitors, Groupware for collaborative human activities (components, work flows, Scheduling) , object brokers (components)- Webservers- Components, URL,HTML, HTTP,HTML Web-based Forms, tables, CGI-Sever side of the web, web security and S-HTTP, Firewalls, web client and JAVA,VB clients.

Client-Server Applications Development : Client application development environments, Development tools, Developing Applications on RDBMS, GUI design concepts, evaluation of database servers. .

Developing client applications of real-life on RDBMS like, Ingres, Oracle or Sybase Using the client application developer tools like Power builder, Delphi or Developer 2000.

Emerging Computing Trends: Client-server databases. Distributed objects, GUI based client applications, Managing client-server applications, active databases, Multi-media databases, Deductive databases concepts of next generation databases and Data warehouses.

Books:

1. Robert Orfa, dan Harkey and I. Edwards: The Essential Client/Server Survival Guide; 2nd Edn, John Wiley & Sons, 1996.
2. Beth Gold bernstien and David Marca: Desining Enterprise Client/Server Systems, PHI, 1998. .
3. Berson: Client Server Architecture: 2nd Edn, Mac Graw Hill.

503 SIMULATION AND MODELING

Introduction and Motivation - System concepts & theories in brief, Systems - continuous (discrete, tochastic/deterministic, open/closed.

System Dynamics (SO) : Foundations of SO, Elements of SO modelling - physical flows, flow diagrams, Table functions. causal loop diagramming, Order of a system - first/second order positive/negative feedback systems, steps in SD modelling, Building and simulating SD

models - developing model equations, dependence among model variables, algorithm for Euler - integration, Features of simulation packages - DYNAMO, DYSBASE, Simulation-inventory control model, production-distribution problem. .

Generation of Random Numbers and their Applications: Pseudo random numbers and algorithm for generating them-middle-square method, linear congruently method, Testing and validating pseudo random sequences, Non-uniform variates-Inverse-transform method, Generation of normal random numbers (binomially, exponentially)-Monte Carlo (MC) integration - Integration, (hit or miss MC method error analysis, Sample mean MC method, efficiency of MC method.

Discrete System, Simulation and Model Validation: Simulation terminology, Time management methods, Object generation, Events and event synchronization, Queue management and list processing, Collecting and recording simulation data, Evaluation of the simulation model.

Design of simulation Experiments and Output Analysis: Validation of simulator, completely randomized design, Randomized complete block design Factorial design, Network simulation model performance analysis, Estimation of model parameters, Analysis of simulation results, estimation and confidence limits.

Languages for Discrete System Simulation: Language characteristics, Use of Multipurpose languages, example; Simulation languages - GPSS, Special-purpose languages: SIMSCRIPT 11.5, GASP IV

Queueing Theory and Simulation: Queueing system, M/M/1/FIFO system, Measures for M/M/1/FIFO - expected number in system/queue, expected time in the system/queue, M/M/1/K/FIFO system, M/M/C/FIFO system, Priority queueing system.

Books

1. Pooch Udo w., James A, Wall: Discrete Event Simulation (A Practical -Approach), CRC Press" 1993.
2. Mohapatra P.K.J., Mandal P., Bora M.C. : Introduction to System Dynamics Modelling, Universities Press (India) Ltd, 1994.
3. Rubinstein RY : Simulation and the Monte Carlo Method, John wiley , & Sons 1981.
4. Law A.M., Kelton W.D. : Simulation Modeling and Analysis. McGraw Hill Intl. Ed. (Second Edition) 1991.

ELECTIVES

Group III

311 ARTIFICIAL INTELLIGENCE AND APPLICATIONS

Prerequisite : System software, Operating System, Data and File structure.

Introduction of Artificial Intelligence: Simulation of So called intelligent behaviour, in different areas; Problem solving: games, natural language, question answering, visual perception, learning; Aim-oriented (heuristic) algorithms versus solution guaranteed algorithms.

Understanding Natural Languages: Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, fillmore's grammars, Shank's conceptual

dependency, grammar-free analysers, sentence generation, translation.

Knowledge Representation: First-order predicate calculus Horn's clauses; The language PROLOG; Semantic nets, Partitioned nets, Minsky's frames, case-grammar theory; production rules, knowledge base, the inference system, forward and backward deduction.

Expert system: Existing systems (DENDRAL, MYCIN) : domain exploration; meta - knowledge, expertise transfer, self - explaining systems.

Pattern Recognition structured Descriptions: Symbolic description, machine perception, line finding, interpretation semantics and models, object identification, speech recognition. The language LISP and for Prolog is to be covered in this course.

Books:

1. Charniak, E. : Introduction of Artificial Intelligence, Narosa Publishing House.
2. Winston, PH. : LISP, Narosa publishing House.
3. Marcellus: Expert Systems Programming in TURBO PROLOG, Prentice-Hall Inc. 1989.
4. Clark, K.L. & McCabe; EG. : Micro-Prolog. Prentice Hall India, 1987.
5. Elaine Rich & Kevin Knight: Artificial Intelligence; Tata McGraw Hill.
6. Dan W. Patterson: Interoduction to Artificial Intelligence and Expert System; PHI.

312 PARALLEL PROCESSING

Prerequisite: Computer Organisation, Architecture, Operating System.

Introduction of Parallel Processing: Parallel Processing Mechanisms; Parallelism in uniprocessor systems, Pipeling and Vector Processors; SIMD Array Processors; Systolic Array; Wefer, Scalability, Associativity; Crossbar Network; Multistage Network; Dynamic Communication. Parallel Algorithms for SIMD and Multi Processor Systems: Parallel algorithms for merging, searching and sorting using linear array, mesh, cube and perfect shuffle inter connected SIMD systems. Quick sort based parallel algorithms; FIT algorithm" Parallel algorithm for solution of linear equations. Parallel algorithms for graph search, connected components, shortest path and minimum cost spanning tree, Divide and conquer, branch and bound algorithms.

Data Flow Computers: Data-driven computing and languages; Advantage and potential difficulties, etc.

Books:

1. Hawang, K, Brigg, F.A.: Computer Architecture and Parallel Processing, McGraw Hill, 1985.
- 2, Michael J. Quinn: Parallel Computing -Theory and practice, McGraw-Hill International Edition, end Edition, 1994.
- 3, Selim G, AKL : Design and Analysis of Parallel Algorithms; Printice Hall.
4. Hwang K, . Advance Computing Architecture -Parallelism, Scalability and Programming; McGraw Hill International Edition, 1993.

313 DECISION SUPPORT SYSTEM

Prerequisite: Information System Design and Implementation.

Review of Decision making process in business and industrial environment, Quantitative techniques for decision making, Gaming and game theory, Group decision
Evolution of Decision Support System (DSS) Specific DSS, DSS generator and DSS Tools, Data, Model and Dialog Management System and Interfaces between them. Graphical and quantitative tools to build model and model management
Adaptive Design approach to DSS development. Accommodating cognitive style in DSS, Integrating Expert and decision support system and case studies.

Books:

1. Bennis, J.L. : Building Decision Support System Addison, Wesley Publ, Comp- 1983
2. Sprague, R.H, & Watson, HJ (Edn.) : Decision Support System, Putting Theory and Practices Prentice-Hall, New Jersey, 1986.
3. Keen, P.G.W. & Morton, M.S.S. : Decision Support System: An organisational Perspective, Addison-Wesley Publ.
4. David: Applied Decision Support System, Prentice-Hall International 1989.

314 INTERACTIVE COMPUTER GRAPHICS

Prerequisite : Data and File Structure the role.

Introduction to Display Devices: Line and point plotting system Raster, Vector, pixel and point plotters, continual refresh and storage displays, Digital frame buffer, Plasma panel displays, Very high resolution devices, High-speed drawing, display processors, character generators, Colour-display techniques (Shadow mask and penetration CRT, colour look-up tables analog false colours, hard-copy colour printers)

Transformation and Projections: Screen co-ordinates, user coordinates; Graphical data structures (compressed incremental list, vector list, use of homogeneous co-ordinates); Display code generation. Graphical functionals - The view algorithm, two dimensional transformation for translation, scaling, rotation, shear. Parallel Projection (One/two vanishing Point)

Interactive Graphics: Pointing and positioning devices, Interactive graphical techniques; Positioning, Elastic lines, Inking, zooming, panning, clipping (Sutherland-Cohen and Cyrus Beck algorithms), windowing, scissoring.

Graphic languages: Primitives (constant actions, operators, variables), Plotting and geometric transformations, displays, subroutines.

3-D graphics: Wire-frame perspective display, perspective depth, Curve and surface (Bresenham's algorithm, Bezier curves, B-Spline curves); Hidden line and surface elimination (Floating horizon, Back face, Depth buffer, depth sort and scan line methods), transparent solids (Sweeping a polygon/surface depth), shading, GKS is to be used as the standard teaching tool.

Books:

1. Hearn D., Baker P.M.: Computer Graphics, PHL, 1986.
2. Giloi, W.K.: Interactive Computer Graphics, Prentice-Hall.
3. Mewman, W., Sproul R.F.: Principles of Interactive Computer Graphics, McGraw-Hill. 1980.
4. Foley, J.D., Van Dam A.: Fundamentals of Interactive Graphics, Addison-Wesley, 1982.
5. Ronger D.F. : Procedural Elements for Computer Graphics;

ELECTIVES

Group IV

411 UNIX AND SHELL PROGRAMMING

Overview of Operating System: Operating system as an extended machine and as a resource manager, OS concepts of processes, Files, The Shell, OS services, and OS structure.

Overview of UNIX Architecture: History of UNIX kernel - structure and functions, Processes, Time sharing; shell; File and Directory Structures; Filesystems and Peripheral devices.

UNIX Editors and Basic commands: ed and vi editors, Redirections, piping, tees and filters. Utilities - grep, sed, awk, tr, etc.

Shell scripts and awk Programming: Bourne Shell, C Shell; Shell variables, scripts, metacharacters and environment; Shell programming and scripts, control and looping statements. Awk Programming - Awk Pattern scanning and processing, Awk arithmetics, operators and variables, Arrays and strings

UNIX Internals and Security: Process management, Memory management, File and Directory Structures. Security.

System Calls and C function Library: UNIX system calls, C library function and math library, std I/O package, File Handling, Command line parameters, UNIX - C interface, C files, Graphics.

System Administration: The System Administrator - the need and the role, Functions of a System Manager - Organisation of HD - AT&T file system, Berkeley file system, Block and Fragmentation, Program fsck. Partitions - mount, unmount, tables/etc/fstab & etc/mstab. User management; Connections of peripherals and Regeneration of UNIX Kernel.

Networks and Internet: Local Networking - NFS, NIS and their functionalities, Berkeley and Arpa services, Xterminals; Safety aspect of local networking. Global Networking - e-mail, uucp protocols and front ends; News services. Internet - Routers and Gateways, Unix Internet services.

Books:

1. Kernighan B W and Rikie R.:The UNIX Programminmg Environment;PHI,1995.
2. Prata S.:Advanced UNIX Programmer's Guide;BPB Pub,New Delhi.
3. Trommer I. & Schimdt S S:System Administration under Unix;Galgotia Publications,New Delhi,1995.
4. Bart Andersion et:Unix Communications and Internet;PHI,New Delhi,1995.
5. Das Sumitabha.:UNIX:Concepts & Applications,2nd edn;Tata McGraw Hill.

412 INTERNET AND INTRANET

Basic of Computer Communications, OSI model of ISO and Networks. Internet Evolution and Applications. Introduction to TCP/IP, Request for Comments (RFC), Overview of TCP/IP Services. Internet service providers; Types of connectivity (dial-up, leased, VSAT etc.), Internet Server and Client modules.

TCP/IP Architecture: Overview of Layering, Protocols and Topologies; Architecture of IP, TCP and UDP. Physical and Data Link Technologies - PPP, HOLC, Packet network, The 802 networks, Network Interfaces, Link layer issues.Naming and Addressing of Internets and subnets and subnets, Domain name system, Address resolution protocol.

Internet Protocol -Operational model; Functions, IF protocol mechanisms, Data processing and IP performance issues, Service Interfaces.

Internet Control Message Protocol: ICMP error and query messages; IP Routines, RIP and OSPF protocols; External gateway protocols.

User datagram protocol, Transmission Control Protocol -Concepts, mechanisms and performance, TCP Header. File Transfer Protocol (Public domain S/W, Types of FTP servers and Clients, Commands), NFS,RPC and NIS.

E-mail network and protocols and Listservers.

Usenet, Telnet, Electronic Mail, Administration of TCP/IP network- World Wide Web - Basic features, Browsers, servers, HTTP & URL. Planning Web site, Designing and creating WeB sites with HTML/Front-Page, Administering and maintaining web sites.HTML language.

Internet Security - Threats, External security, firwealls; Building and Managing own Internet-Introduction to searching Engine and Commerce on Net.

Interactivity Tools-CGT, Activex, VB Script, ASP, JAVAScript and JAVA.

The Java language: Introduction, JAVAAs Internet Delovelment Tool; Applets and Applications; JAVA Features and security, OOP; Class libraries; Data types and variables; operators, Control structures, Objects and classes; Inheritance, Packages and Interfaces; I/O Streams and Threading; 2D Graphics; IDBC Database Access and the JAVA library.

Books:

1. Sidnic Feit : TCPIIP Architecture, Protocols and Implementation; McGraw Hill.
2. Alexis Leon and Mathews Leon: Internet for Everyone; Leon Tech World.
3. Douglas Comer: The Internet Book; PHI.
4. Patrick Naughton and herbert Schildt: The Complete Reference JAVA; Tata McGraw-Hill Publ,
5. Ivan Phillips and others: mastering JAVA;BPB Publ.

6. Internet Engineering Notes: IEN documents NIC.
7. NIC documents in /netinfo/rfc-index-txt.

413 SOFTWARE ENGINEERING

Prerequisite: Computer Programming & Problem Solving, Data and File structure.

Introduction to Software Engineering: Software development and life cycle; Software engineering, knowledge engineering and end-user development approaches.

System Analysis: Abstraction, partitioning and projection; Software Requirements and Specifications; Specification methods and tools. Flow based, data based and object based analysis.

Software Project Management: Project size and its categories; Planning a software project; Work breakdown structures; Integrating software design and project planning; Software project teams; Project monitoring and control.

Software Quality and Testing: Software quality assurance, Types of software testing. Debugging and Reliability- Concept of software reliability, software errors, faults, repair and availability. Program complexity analysis; Software quality and matrices.

Software cost and time estimation: Functions points. Issues in software cost estimation (Introduction to the Rayleigh curve), Algorithm cost models(COCOMO,Putnam-Slim, Watsonand Felix), Other approaches to software cost and size estimation (S/W complexity, Delphi, cost by analogy).

Software Design: Various design concepts and notations; Process oriented design (Gane & Sarson and Yourdon notations), Data-oriented design (Warnier-Orr, ER-modelling), Object-oriented design (Booch approach), Verification and validation methods; Documentation and implementation procedures; Design matrices. Role of CASE - tools in software design.

Modern Programming language Features Relevant to Software Engineering: Choice of programming languages. Mixed language programming and call semantics. Re-engineering legacy systems, coding standards. A brief introduction of ADA (Modula. 11) language and explanation of concepts such as data, abstraction, exception handling, concurrency mechanism, etc.

Books:

1. Pressman Roger: Software Engineering -A Practitioner's Approach; Tata McGraw Hill, N.Delhi,-1991-
2. Jalote pankaj: An Integrated Approach to Software Engineering; Narosa, New delhi, 1991.
3. Fairley, R.E. : Software Engineering Concepts, McGraw-Hill,
4. Shooman, M. : Software Engineering, McGraw-Hill
5. Shere: Software Engineering & Management, Prectice-Hall.

MCA 6th Sem.

Project (Minor)

Seminar