

DATA STRUCTURES

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

1. SORTING AND SEARCHING TECHNIQUES

Bubble, Selection, Insertion, Shell sorts and Sequential, Binary, Indexed Sequential Searches, Interpolation, Binary Search Tree Sort, Heap sort, Radix sort

Analysis of Algorithms

Algorithm, Pseudo code for expressing algorithms, time complexity and space complexity, O-notation, Omega notation and theta notation.

2. HASHING TECHNIQUES

- Hash function
- Address calculation techniques, Common hashing functions
- Collision resolution
- Linear probing, Quadratic
- Double hashing
- Bucket hashing
- Deletion and rehashing

3. LINEAR LISTS

- Stacks: LIFO structure, create, POP, PUSH, delete stack
- Queues: FIFO structure Priority Queues, Circular Queues, operations on Queues
- Linear List Concept
- List v/s Array, Internal pointer & External pointer, head, tail of a list, Null list, length of a list
- Linked Lists
 - Nodes, Linked List Data Structure
- Linked Lists algorithms
 - Create List
 - Insert Node (empty list, beginning, Middle, end)
 - Delete node(First, general case)
 - Search list
 - Retrieve Node, add node, Remove node, Print List
 - Append Linked List, array of Linked Lists
- Complex Linked List structures
 - Header nodes
 - Circularly-Linked List
 - Doubly Linked List
 - Insertion, Deletion
 - Multilinked Lists
 - Insertion, Deletion

4. INTRODUCTION TO TREES

- Binary Trees
 - Travesals (breadth-first, depth-first)
- Expression Trees
 - (Infix, Prefix, Postfix Traversals)
- General Trees
- Search Trees
- Binary Search Trees

5. HEAPS

- Structure
- Basic algorithms – ReheapUp, ReheapDown, Build heap, Insert, Delete

6. MULTIWAY TREES

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- M-way search trees
- B-Trees
 - Insertion (Insert node, Search node, Split node, Insert entry)
 - Deletion (Node delete, Delete entry, Delete mid, ReFlow, Balance, Combine)
 - Traverse B-Tree
- B-Tree Search

- **GRAPHS**
 - Terminology
 - Operations (Add vertex, Delete Vertex, Add Edge, Delete Edge, Find Vertex)
 - Traverse Graph (Depth-First, Breadth-First)
 - Graph Storage Structures (Adjacency Matrix, Adjacency List)
 - Networks
 - Minimum Spanning Tree
 - Shortest Path Algorithm
 - (Dijkstra's algorithm, Kruskal's algorithm, Prim's algorithm, Warshall's algorithm)

Term work/Practical : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus along with the flow chart and program listing. Internal tests to be conducted separately.

1. Data structure – A Pseudocode Approach with C – Richard F Gilberg Behrouz A. Forouzan, Thomson
2. Schaum's Outlines Data structure Seymour Lipschutz Tata McGraw Hill 2nd Edition
3. Data structures & Program Design in C Robert Kruse, C.L.Tondo, Bruce Leung Pearson
4. "Data structure using C" AM Tanenbaum, Y Langsam & MJ Augustein, Prentice Hall India
5. "An Introduction to Structure with application" Jean – Paul Trembly & Paul Sorenson
6. Data structure & program design in C RL Kruse, BP Leung & CL Tondo Prentice-Hall
7. Data structure & Algorithm Analysis in C Weiss, Mark Allen Addison Wesley

PROGRAM LIST IN DATA STRUCTURES

1. Write a program in C to implement simple Stack, Queue, Circular Queue, Priority Queue.
2. Write a menu driven program that implements singly linked list for the following operations: Create, Display, Concate, merge, union, intersection
3. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
4. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, Concate, merge, union, intersection
5. Write a menu driven program that implements Singly circular linked list for the following operations: Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
6. Write a program in C for sorting methods.
7. Write a menu driven program in C to
 - a. Create a binary search tree
 - b. Traverse the tree in Inorder, Preorder and Post Order
 - c. Search the tree for a given node and delete the nodeWrite a program in C to implement insertion and deletion in B tree
8. Write a program in C to implement insertion and deletion in AVL tree
9. Write a menu driven program that implements Heap tree (Maximum and Minimum Heap tree) for the following operations. (Using array) Insert, Delete
10. Write a program to implement double hashing technique to map given key to the address space. Also write code for collision resolution (linear probing)
11. Write a program in C to implement Dijkstra's shortest path algorithm for a given directed graph.

12. Write a program in C to insert and delete nodes in graph using adjacency matrix.
13. Write a program in C to implement Breadth First search using linked representation of graph.
14. Write a program in C to implement Depth first search using linked representation of graph.

Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)

15. Write a program in C to create a minimum spanning tree using Kruskal's algorithm.
16. Write a program in C to create a minimum spanning tree using Prim's algorithm

OPERATING SYSTEM

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

1. System Software

- Overview of all system softwares :
 - Operating system
 - I/O manager
 - Assembler
 - Compiler
 - Linker
 - Loader

2. Fundamentals of Operating System

- OS services and Components
- Multitasking
- Multiprogramming
- Timesharing
- Buffering
- Spooling

3. Process and Thread Management

- Concept of process and threads
- Process states
- Process management
- Context switching
- Interaction between processes and OS
- Multithreading

4. Concurrency Control

- Concurrency and Race Conditions
- Mutual exclusion requirements
- Software and hardware solutions
- Semaphores
- Monitors
- Classical IPC problems and solutions
- Deadlock
 - Characterization
 - Detection
 - Recovery
 - Avoidance and Prevention

5. Memory Management

- Memory partitioning
- Swapping
- Paging
- Segmentation
- Virtual memory
 - Overlays
 - Demand paging
 - Performance of Demand paging
 - Virtual memory concepts

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- Page replacement algorithms
- Allocation algorithms

6. I/O Systems

- Principles of I/O Hardware
 - I/O devices
 - Device controllers
 - Direct memory access
- Principles of I/O Software
 - Goals
 - Interrupt handlers
 - Device drivers
 - Device independent I/O software
- Secondary-Storage Structure
 - Disk structure
 - Disk scheduling
 - Disk management
 - Swap-space management
 - Disk reliability
 - Stable storage implementation
- Introduction to Clock
 - Clock hardware
 - Clock software

7. File Systems

- File concept
- File support
- Access methods
- Allocation methods
- Directory systems
- File protection
- Free space management

8. Protection & Security

- Protection
 - Goals of protection
 - Domain of protection
 - Access matrix
 - Implementation of access matrix
 - Revocation of access rights
- Security
 - The security problem
 - Authentication
 - One-Time passwords
 - Program threats
 - System threats
 - Threat monitoring
 - Encryption
 - Computer-security classifications

9. Linux System

- Linux introduction and file system – Basic features, advantages, installing requirement, basic architecture of UNIX/Linux system, Kernel, Shell.

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- Commands for files and directories cd, ls, cp, mv, rm, mkdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces. Essential linux commands. Understanding shells, Processes in linux – process fundamentals, connecting processes with pipes, Redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep, Printing commands, grep, fgrep, find, sort, cal, banner, touch, file, file related commands – ws, sat, cut, grep, dd, etc. Mathematical commands – bc, expr, factor, units. Vi, joe, vim editor.
- Shell programming: Shell programming basic, various types of shell, shell programming in bash, conditional and looping statements, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks and report printing, use of grep in shell, awk programming.

Term work/Practicals : Each candidate will submit a journal /assignments in which at least 10 assignments based on the above syllabus along with the flow chart and program listing will be submitted with the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

Relevant Books:

1. Operating Systems Achyut S. Godbole Tata McGraw Hill 2nd edition
2. Operating Systems D.M.Dhamdhare Tata McGraw Hill 2nd edition
3. Understanding Operating System : Flynn & Mctloes 4th edition, thomson
4. Operating Systems Design & implementation Andrew S. Tanenbam, Albert S. Woodhull Pearson
5. Operating System Concepts (7th Ed) by silberschatz and Galvin, Wiley, 2000
6. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall, 2000
7. Operating System Concepts (2nd Ed) by James L. Peterson, Abraham Silberschatz, Addison – Wesley.
8. Computer Organisation and Architecture (4th Ed) by William Stallings, Prentice Hall India, 1996
9. Modern Operating Systems by Andrew S Tanenbaum, Prentice hall India, 1992
10. UNIX – Sumitabha Das
11. Unix Shell Programming - Yashwant Kanetkar, BPB publications

List of Practicals for Operating System

1. Study of Basic commands of Linux
2. Study of Advance commands of Linux.
3. Study of current directory according to the following arguments:
 - a. Suffix to be replaced
 - b. Replacement suffix

The script should rename each matching file name suffix with replacement suffix. For example: rename txt text will rename the file atxt to atext. However no overwriting of existing files nor renaming of the special directories . and .. is allowed. Hint : You can use the command mv to rename a file.

B) Write a BASH shell script prime which will accept a number b and display first n prime numbers in standard output.

4. Shell scripting using general-purpose utilities.
Eg. A) Write a menu driven shell script which will print the following menu and execute the given task to display result on standard output.

MENU

- 1 Display calendar of current month

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- 2 Display today's date and time
 - 3 Display usernames those are currently logged in the system
 - 4 Display your name at given x,y position
 - 5 Display your terminal number
 - 6 Exit
5. Shell programming using filters (including grep, egrep, fgrep)
 6. Write a shell script to validate the entered date. (eg. Date format is: dd-mm-yyyy)
 7. Write a shell script to check entered string is palindrome or not
 8. Write the awk program uncomment.awk which removes any comment from a C program. You can assume that the C source code contains only syntactically correct comments:
 - . starting with //, ending with a new line
 - . starting with /*, ending with */ (can be multi-line)
 - . nesting of comments is not allowedMake sure that the number of lines of the C source code is not changed! When a line contains comments only, replace this line with an empty line.
 9. Write an awk program using function, which capitalizes each word in a given string.
 10. Write a program for process creation using C. (Use of gcc compiler)
 11. Use of g++ compiler.

ACCOUNTING & FINANCIAL MANAGEMENT

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

1. Accounting process and principles, financial, cost and management accounting.
2. Elements of book keeping, Journal, cash and handbook, Book reconciliation statement, Ledger, trial balance, profit and loss accounts, final accounts of proprietary and partnership concern and balance sheet.
3. Cost accounting – Objectives, elements of cost, understanding of the different methods of costing.
4. Financial Management – Meaning, scope and role, a brief study of functional areas of financial management. Introduction to various FM tools : Ration Analysis
 - Meaning
 - Basis of comparison
 - Types of ratios
5. Working Capital Management : Theory of Working Capital Management: Introduction, Nature of Working Capital, Concepts and Definitions of Working Capital, Need for Working Capital, Permanent and Temporary Working Capital, Changes in Working Capital, Determinants of Working Capital.
6. Budgeting – budgets, purpose, budgetary control, preparation of budgets, master budget, fixed and flexible budgeting.

Reference Books:

1. "Book Keeping and Accountancy" Choudhari, Chopde
2. "Cost Accounting" : Choudhari, Chopde
3. "Financial Management" Text and Problems : M.Y.Khan, P.K.Jain
4. "Financial Management Theory & Practice" Prasanna Chandra Tata McGraw Hill
5. Managerial Economics & Financial Analysis, Siddiqui S.A. Siddiqui A.S. New Age

COMPUTER GRAPHICS

Lecture : 4 Hrs/week

Practical : 3 Hrs/week

One paper: 100 marks / 3 Hrs duration

Practical exam: 50 marks

Term work: 25 marks

1. Introduction

- What is C.G.?
- Elements of Graphics Workstation
- Video Display Devices, Raster Scan Systems & Random Scan Systems
- Input devices, Graphics Software Coordinate representations
- Display adapters

2. Algorithms

- **Algorithms** : DDA algorithm, Bresenham's line algorithm, Frame buffers, Bresenham's midpoint circle algorithms, midpoint ellipse algorithm, Polynomials and spline curves
- **Filling** : Filled area primitives, Scan-line polygon fill algorithm
- **Inside-Outside tests**
- **Scan-line fill of curved boundary areas**
- **Boundary fill algorithm, Flood fill algorithm**
- **Character Generation**

3. Graphics Primitives

- Primitive Operations
- The display file interpreter
- Display – File structure
- Display control and polygons-polygon representation

4. Attributes of output primitives

- Line attributes : Line type, Line width, Pen and brush options, Line color, Color and grayscale levels.
- Color tables, grayscale, Area-fill attributes-fill styles, pattern fill, soft fill, character attributes, text attributes.

5. Geometric Transformations

- Matrices, Scaling transformations, Sin and Cos Rotation, Homogeneous Coordinates and Translation, Other transformation (Reflection and shear)
- Coordinate Translations, Rotation about an arbitrary point
- Inverse transformations
- Transformation routines
- Reflection & Shearing Transformations

6. 2D Viewing

- The viewing pipeline, Viewing coordinate reference frame, Window to Viewport coordinate transformation, 2D-Viewing functions.
- Clipping operations – point clipping, line clipping, Cohen-Sutherland line clipping, Line Intersection Clipping & Midpoint subdivision algorithm, Cyrus-Beck algorithm, Liang-Barsky line clipping algorithm, character clipping, text clipping, Polygon clipping, Sutherland-Hodgeman polygon clipping.

7. 3D Concepts

Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)

- 3D Display methods – Parallel projection, perspective projection, visible line and surface identification
- 3D transformation matrices – Translation, Rotation & Scaling
- Surface rendering
- 3D object representations – Bezier curves and surfaces, B-Spline Curves and Surfaces

8. Visibility, Image and object precision Z-buffer algorithm, A buffer method, Scan line method, Floating horizons.

9. Light, Color and Shading

- Introduction, Diffuse illumination, point source illumination, Specular reflection – The Phong illumination model, The Halfway vector.
- Shading algorithms – Constant-Intensity shading, Gouraud shading, Phong shading, Half-tone shading, Dithering techniques
- Colour Models – RGB Colour model, CMY Colour Model, HSV Colour model
- Transparency, Shadows, Ray tracing

10. Fractals

- Introduction, Topological Dimension, Fractal Dimension, Hilbert's curve, Koch Curve, Fractal lines, Fractal surfaces

11. Computer Animation

- Design of animation sequences, general computer animation functions – Raster animations, Key-frame systems, Morphing, Simulating accelerations, Motion specifications, Kinematics and dynamics.

Reference :

1. Computer Graphics – Donald Hearn & M.Pauline Baker, Prentice Hall of India
2. Computer Graphics, Steven Harrington, McGraw Hill
3. Computer Graphics Principles and Practice, J.D.Foley, A.Van Dam, S.K.Feiner & R.I.Philips, Addison Wesley
4. Principles of Interactive Computer Graphics – William M. Newmann, Robert F. Sproull, McGraw Hill
5. Introduction to Computer Graphics J.D.Foley, A.Van Dam, S.K.Feiner & R.I.Philips, Addison Wesley
6. Mathematical elements of Computer Graphics by Rogers
7. Procedural Elements of Computer Graphics by Rogers
8. Computer Graphics for Scientists & Engineers Asthana R.G.S, Sinha N.K. New Age
9. Computer Graphics ISRD Group Tata McGraw Hill

List of Practicals for Computer Graphics to be implemented in C programming language

1. Implementation of Line Drawing algorithms
2. Implementation of Scan-Line Polygon Fill Algorithm
3. Implementation of Circle Drawing Algorithm
4. Implementation of Ellipse Drawing Algorithm
5. Implementation of 2D Transformations
6. Implementation of Line Clipping Algorithms
7. Implementation of Polygon Clipping, character and text Clipping Algorithm
8. Implementation of 3D Transformations
9. Implementation of Character Generation
10. Implementation of Bezier curves, B-Spline Curves
11. Implementation of Visible Surface methods
12. Implementation of Shading Algorithms
13. Drawing a Smiley using Fractals

PROBABILITY AND STATICS

Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

1. Unit I

Sample Space, Events, Axioms of Probability, Probability Space, Probability of Composite Events, Conditional Probability, Bayes Theorem, Independent Events

2. Unit II

Single Random Variable, Distribution and Density Functions, Expectation values, Moments, Definition of Median, Mode. Measure of dispersion, Skewness and Kurtosis. Characteristic and Moment generating functions. Examples of Discrete Random variables (Bernoulli trials, Poisson variables, geometric distribution) and Continuous random variable (Normal distribution, Beta and Gamma distributions)

3. Unit III

Two Random variables. Joint probability distribution and density functions. Marginal and Conditional distributions. Correlation coefficient and ratio. Independent variables. Many random variables. Correlation matrix.

4. Unit IV

Statistics. Frequency distribution. Geometric and Harmonic mean. Parameter Estimation, Biased and Unbiased Estimators, Efficient Estimator, Optimal Estimator, Sufficient Estimator. Hypothesis testing. Chi Square test. Student t-test.

5. Unit IV

Single server queue. Erlang distribution and Poisson Process. Stationary queue. Non-Erlang arrivals and modification of steady state queue concepts.

Term work/Practicals : Each candidate will submit a journal in which assignments based on the above syllabus and the internal test paper. Test graded for 10 marks and Practicals graded for 15 marks.

References :

1. Introduction to Probability & Statistics , Menclenhall 12th edition, Thomson
2. Introduction to Probability & Statistics J.Susan Milton, Jesse C. Arnold Tata McGraw Hill
3. Probability and its computer applications : Kishore Trivedi, PHI
4. Schaum's Outlines Probability, Random Variables & Random Process Tata McGraw Hill
5. Fundamental of Mathematical Statistics – S.C.Gupta, V.K.Kapoor

COMMUNICATION & SOFT SKILLS

Lecture : 4 Hrs/week

Tutorial : 1 Hr/week

One paper: 100 marks / 3 Hrs duration

Term work: 25 marks

1. Communication

Concept and meaning of communication, barriers to communication, methods of communication, techniques to improve communication

2. Summarization

Techniques to summarize a given passage to test comprehension and ability to present written matter in a brief and concise manner.

3. Comprehension and vocabulary

Syllabus for MCA First Year Semester – II (with effect from the academic year 2007-2008)

Technical, scientific or general text with multiple-choice question to test analytical skills, comprehension, expression, vocabulary and grammar (synonyms, antonyms, one-word substitution, word formation)

4. Basic official correspondence

Principles of correspondence, languages and style in official letter, formats of letters, (complete-block, modified-block, semi-block) types of letters, (enquiry, replies to enquires, claims and adjustments, application letters with bio-data)

5. Communication in a business organization

Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions). External Communication. Strategies for conducting successful business meeting. Documentation (notice, agenda, minutes) of meeting.

6. Advanced technical writing

I] Report writing and presentation: Definition and importance of reports. Qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-reports). Methods of compiling data. A computer-aided presentation of a technical project report based on a survey-based or reference-based topic. Topics to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.

II] Technical paper writing

III] Writing Proposals

7. Interpersonal skills

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution, Assertiveness, leadership, Team-building, Decision-making, Time-management.

8. Interview techniques

Preparing for job interviews, verbal and non-verbal communication during interviews. Observation sessions and role-play techniques to be used to demonstrate interview strategies.

9. Group discussion

Dynamics of Group Behaviour, Techniques for effective participation.

Term work:

Each student is to appear for atleast one written test during the term. Term work consists of graded answer paper of the test. Presentations, group discussions, report writing, interpersonal skills

Recommended Books :

1. Business correspondence and report writing, R.C.Sharma & Krishna Mohan, Tata McGraw Hill
2. Business Communication for Managers, Penrose, Thomson
3. Technical Communication 6th Edition, Anderson, Thomson
4. Effective Technical Communication Rizvi, Tata McGraw Hill Publications
5. English for Engineers & Technologists : A skill approach (Books 1 and 2) Course Authors (Humanities and Social Science Division, Anna University, Madras. Orient Longman (Mainly for Comprehension)
6. Technical Writing & Professional Communication, Huckins, Thomas, McGraw-Hill publications. Written Communication, Freeman, Sarah, Orient Longman.