MCA371-DATA STRUCTURES IN C

Total Teaching Hours For Semester:90 **No of Lecture Hours/Week:8**

Max Marks:150 **Credits:4**

Course Description and Course Objectives

To explore elementary data structures in computer science, and learn to implement them in C. The data structures include linked lists, stacks, queues, trees, heaps, hash tables, and graphs. It also introduces different techniques for searching, traversing trees, hashing, manipulating priority queues, sorting, finding shortest paths in graphs.

Course Outcomes

CO1: Describe common applications for arrays, linked structures, stacks, queues, trees, and graphs

CO2: Illustrate various techniques for searching, sorting and hashing

CO3: Design and implement an appropriate data structures to solve real world problems

Unit-1 Teaching Hours:18

ELEMENTARY DATA STRUCTURES

Introduction to Pseudo code - Overview of Time & Space Complexity – Recursion – Abstract Data Type - Array - Stack - Queue - Linked lists - Traversing - Searching - Insertion - Deletion - Circular Linked list - Two-way Lists (Doubly) - Linked List Implementation of Stack and Queue - Application of stacks and Queues.

Lab Exercises:

1. Write a program to convert an infix expression to the postfix form.

2. Implement linked list and its operations.

Unit-2 Teaching Hours:18

SORTING AND SEARCHING

Bubble Sort – Insertion – Selection – Quick – Merge – Linear Search – Binary search – Hashing – Chaining – Collision Resolution – Open Addressing – String Matching Algorithms: Naive, KMP

Lab Exercises:

3. Implement the concept of sorting technique

4. Implement the concept of searching/pattern matching technique

Unit-3 **Teaching Hours:18**

GRAPHS & TREES

Representation of Graphs - Operations on Graphs - Depth First and Breadth First Search - Topological Sort - Minimum Spanning Tree Algorithms - Binary Tree - Traversing Binary Trees - Binary Heap - Priority Queue - Heap sort.

Lab Exercises:

5. Implementation of Minimum Spanning Tree

6. Implementation of BFS and DFS

Unit-4 **Teaching Hours:18**

SEARCH TREES

Binary Search Trees - Searching, Inserting and deleting in Binary Search Trees - AVL Trees - AVL Balance Factor, Balancing Trees, AVL node structure, AVL Tree Rotate Algorithms

Lab Exercises:

7. Implementation of BST

8. Implementation of AVL Tree

Unit-5 **Teaching Hours:18**

ADVANCED DATA STRUCTURES

B Trees – Operations on B Trees - B+ Trees - Red-Black Trees - Properties of Red-black Trees - Rotations - Insertion - Deletion operations

Lab Exercises:

9. Implementation of B Trees

10. Implementation of B+ Trees

Essential References

[1] Gilberg, F Richard & Forouzan, A Behrouz, Data Structures A Pseudocode approach with C,Cengage. 2nd Edition, 2008.

[2] Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009

[3] Peter Brass, Advanced Data Structures, Cambridge University Press.

Recommended References

[1] Horowitz Sahni Anderson-Freed, Fundamental of Data Structures in C, Universities Press, Reprint, 2008.

[2] Yashavant Kanetkar , Data Structures Through C, BPB Publications, 2019.

[3] Robert Sedgwick, Kevin Wayne, Algorithms, Addison-Wesley Publishing Company. 4th Edition, 2011.

Web Resources:

[1] https://www.hackerrank.com/domains/data-structures

[2] https://nptel.ac.in/Programming and Data Structure by Dr.P.P. Chakraborty, Department of Computer Science and Engineering, IIT Kharagpur

Evaluation Pattern

CIA	ESE
50%	**50%**