Course Code	Course Title	Total Credits
MCA CT 202	**Data structures and Algorithm Analysis**	**4**

Course Objectives

- To impart the basic concepts of data structures, algorithms and the analysis phase of algorithms.
- To Understand basic concepts, implementation and applications of stacks, queues, lists, trees and graphs ·
- To understand concepts about searching and sorting techniques.
- To be familiarized with various algorithm design strategies.
- To choose the appropriate data structure and algorithm design method for a specified application.

Module No.	Title & Contents	No. of Sessions
1	**Introduction:** Data Structures, Concepts of Data Structures, Implementation of Data Structures. **Algorithms:** Definition, Performance analysis– Space complexity, Time complexity Asymptotic notation, Practical Complexities, Performance Measurement. **Arrays:** Ordered lists – representation of array, polynomial addition. **Stacks and Queues:** Definition and concepts, Operations on stacks. Application of stacks- Evaluation of arithmetic expression, infix to postfix conversion, evaluation of postfix expressions. Queue:- representation of queue, Operations on queue, Circular queue, Deque, Priority queue, Application of queues.	10
2	**Linked List:** Singly linked list- Insertion, deletion, traversing and searching. Linked stacks and queues, Doubly linked list- Insertion, deletion, Traverse and Search operations. **Trees :** Basic terminology, binary trees, binary tree representation, algebraic expressions, binary tree traversals, Binary Search Tree – Insertion and Searching, Balanced Trees – AVL Tree. **Graphs:** Terminology and representations, Traversals- BFS, DFS	10
3	**Searching and Sorting:** Searching – Linear search, Binary search, Comparison of both methods. **Sorting** – Insertion, Selection, Heap, Radix, Comparison of various sorting methods. **Hashing:** Hashing Concept, Hash functions, Collision Resolution	8
4	**Divide and Conquer method** – General method, Finding the maximum and minimum, Analysis of Binary search, Quick sort and Merge sort.	10

	Greedy Method– The general method, Knapsack Problem, Minimum cost spanning tree- Prim's algorithm and Kruskal's algorithm.	
5	**Dynamic programming Method**- General method, Multistage graphs, All pairs shortest paths. Backtracking:-The general method, The 8-Queens problem. **Branch and Bound General Method**, Least Cost search, control abstraction for LC search. Lower Bound Theory- Comparison Trees for Ordered searching, Sorting	10

Text Books & References

1. Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia , 1994)

2. Data Structures (Schaum's Outline Series) by Lipschutz Seymour, Tata Mcgraw-hill

3. Classic data structures – D Samanta, 2 Edn. (PHI, 2009).

4. Fundamentals of computer algorithms- Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajeshekharan (Universities Press , 2008)

5. Data Structures – a pseudocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn., Cengage Learning C 2005

6. Data Structures Through C in Depth, S.K. Srivastava, Deepali Srivastava, (BPB Publications, 2003).

Learning Outcomes

After completing this course the students will

- Have deep knowledge about the organization of data structures, Arrays, Linked Lists, Stacks, Queues, Trees and Graphs.
- be able to select the appropriate data structures for solving the given problem.
- be familiar with different sorting and searching methods and their features.
- Know the various algorithm design strategies and their applications. Thus will be able to choose the more suitable method for the given scenario.
- Know how to analyze the performance of devised algorithms using different analysis methods.