CSA03   **DATA STRUCTURES**   **3   0   2   4**

Prerequisite: C Programming

Course Objectives

The course on Data structures aims to provide the students with the following:

1.   Understand the abstract properties of various linear and non-linear data structures such as   Stacks, queues, lists, trees and graphs.

2.   Identify the advanced data structures such as balanced search trees, hash tables, priority Queues.

3.   Analyse the various searching and sorting algorithms, including linear search, binary Search, insertion sort, selection sort, heap sort and quick sort.

4.   Choose the appropriate data structure and algorithm for specified applications.

5.   To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

**Course
Outcomes   On successful completion of the course, the student will be able to:**

CO1.   Comprehend the fundamentals of linear and non-linear data structures and their abstract data types.

CO2.   Compare the performance of various searching techniques (Linear Search, Binary Search) and understand the application of different linear data structures such as Linked Lists, Stacks, and Queues.

CO3.   Interpret the concept of a non-linear tree data structure and implement the different types of tree variants.

CO4.   Analyze the principles of hashing and sorting techniques based on their performance and application.

CO5.   Solve graph-related problems using shortest path and minimum spanning tree algorithms, and demonstrate their practical applications in optimizing networks and pathways.

CO6.   Integrate knowledge of data structures acquired throughout the course, applying it to complex programming challenges and optimization problems.

CO7.   Effectively communicate algorithmic solutions and performance analysis of data structures, both orally and in written form, using appropriate technical terminology

CO8.   Ability to code Linear, nonlinear, hashing data structures such as array, stack, queue, linked lists and its operations

UNIT I INTRODUCTION DATA STRUCTURES

Basics - Data - Data object- Data structure - Abstract Data Types (ADT) - realization of ADT in 'C' - Primitive and non-primitive data structure - Linear and non-linear data structure Arrays & Recursion, Performance analysis and Measurement: Time and space analysis of algorithms- Average, best - and worst-case analysis.

UNIT II LINEAR DATA STRUCTURES

ADT array – Operations on arrays - Searching Algorithms - Linear Search - Binary Search ADT – Linked List -Stack – Queue – Applications.

UNIT III TREES

Preliminaries - Binary Tree - Binary Search Tree - Tree Traversals - AVL Tree -Applications of Search Trees – B Tree – Trie - 2-3 tree - 2-3-4 tree - Red Black Tree – Splay Tree

UNIT IV HASHING AND SORTING

Hashing - Hash Function - Separate Chaining – Open Addressing - Linear Probing - Priority Queue –Heaps – Insertion sort - Quick Sort - Merge Sort - Radix Sort – Heap Sort – Time complexity.

UNIT V GRAPHS

Definitions – Types - Topological Sort - Shortest Path Algorithms - Unweighted Shortest Path - Dijkstra's Algorithm - Minimum Spanning Tree - Prims Algorithm - Breadth First Search - Depth First Search.

TEXT BOOKS

1.	Reema Thareja, "Data Structures Using C", 3rd Edition, Oxford University Press, 2023.

2.	Richard F. Gilberg and Behrouz A. Forouzan, "C Programming and Data Structures: A Pseudocode ApproaYashvant Kanetkar, "Data structures through C", 4th Edition, BPB, 2022

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