

Name of Program	Bachelor of Technology (Computer Science Engineering)			
CSET243	Data Structures using C++			L T P C
Owning School/Department	School of Computer Science Engineering and Technology			3 1 6 7
Pre-requisites/Exposure	-			

Course Outcomes (COs)

On completion of this course, the students will be able to:

CO1: Articulate the design, use and associated algorithms of fundamental and abstract data structures.

CO2: Examine various searching and sorting techniques based on complexity analysis for applicative solutions.

CO3: Demonstrate hands-on experience on implementing different data structures.

CO4: Build optimized solutions for real-word programming problems using efficient data structures.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2								2	2		
CO2	3	3	3	3								1	3		
CO3	2	3	3	3								2	3		
CO4	3	2	2										3		

1=weakly related

2= moderately related

3=strongly related

Course Contents:

Module I: **10 lecture hours**

Essentials of Data Structures, Initiating C++: The First Program, Lifecycle of C++ Program Execution, Fundamentals of Object-Oriented Programming (OOP), C++ Inheritance Principles, Multiple inheritance, Friend Function, Run-time Polymorphism, Time Complexity: Asymptotic Analysis, Big-Omega, Big-Theta, Big-Oh Notation, Handling Arrays, Insertion, Deletion, Traversal, Linear Search, Recursion, Binary Search, Tower of Hanoi, Sorting, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Shell Sort, Counting Sort.

Module II: **10 lecture hours**

Navigating C++: Pointers Essentials, Structures and Unions in C++, Exploring Linked Lists in C++, Implementing Singly Linked Lists, Traversal Techniques for Singly Linked Lists in C++, Searching, Insertion, Deletion, Polynomial Handling, Circular Linked List, Traversal, Insertion, Deletion, Stacks, Traversal, Insertion, Deletion, Infix to Postfix Conversion, Post-fix Expression Evaluation, Deques, Queues, Simple Queue Insertion, Deletion, Traversal, Circular Queue Insertion, Deletion, Traversal.

Module III: **11 lectures hours**

Tree Data Structures, Height, Complete, Full, Perfect Trees, Binary Search Trees, Pre-Order, InOrder, Post-Order, BST Searching, BST Insertion, BST Deletion, Heaps, Min-Max Heaps, HeapSort, Hashing, Hash Functions, Hash Tables, Hashing Collision Resolution Strategies: Separate Chaining, Open Addressing, Double Hashing, Graphs, Different Types of Graphs, Graphs Representations, Incidence Matrix, Adjacency Matrix, Graphs Traversals: BFS, DFS, Topological Sort.

Module IV:	11 lectures hours
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Maintaining Height Equilibrium: AVL Trees, Balanced Factor and Rotations in AVL Trees, Operations in AVL Trees: Insertion and Deletion, Exploring Red-Black Trees: Insertion and Deletion, B-Trees: Efficient Insertion and Deletion Operations, Enhanced Structure: B+ Trees and their Insertion and Deletion Operations, Deletion, Disjoint Sets, Path Compression, Union Finding Algorithm, van Emde Boas Tree.

Studio Work / Laboratory Experiments:

The laboratory of Data structures is designed to provide a practical exposure to the students about the concepts and topics taught in the classroom sessions. Implementing the learnt concepts using C++ will help the students to have a better understanding of the subject.

Text Books :

1. Carey, John, Shreyans Doshi, and Payas Rajan. *C++ Data Structures and Algorithm Design Principles: Leverage the power of modern C++ to build robust and scalable applications.* 1st ed. Packt Publishing Ltd, 2019. ISBN 9781838827919.
2. Kanetkar, Yashavant. *Data Structures Through C: Learn the fundamentals of Data Structures through C.* 1st ed. Cengage Learning, 2019. ISBN 9789388511360.

Reference Books :

1. Hu, Yang. *Algorithms C++.* 1st ed. Cengage Learning, 2020. ISBN 9798676695750.