PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE

(Autonomous)

ADVANCED DATA STRUCTURES THROUGH C++

(21A050304)

(Common to AI&ML, CSE, CSE-AI & CSE-IOT Branches)

I B.Tech, II Semester, 2022-23

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COURSE OBJECTIVES:

- To be familiar with basic techniques of object-oriented principles and exception handling using C++
- To be familiar with the concepts like Inheritance, Polymorphism
- Solve problems using data structures such as linear lists, stacks, queues
- Be familiar with advanced data structures such as balanced search trees.

COURSE OUTCOMES:

CO1: Distinguish between procedures and object-oriented programming.
CO2: Apply advanced data structure strategies for exploring complex data structures.
CO3: Compare and contrast various data structures and design techniques in the area of Performance.
CO4: Implement data structure algorithms through C++.
CO5: Incorporate data structures into the applications such as binary search trees.

UNIT- I

Arrays: Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation - Polynomial Addition. Sparse Matrices.

UNIT- II

Stacks and Queues: Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Subtyping and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT- III

Linked Lists – I: Single Linked List and Chains, Representing Chains in C++, defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators - Chain Operations- Reusing a Class, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials.

UNIT- IV

Linked Lists – II: Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists Reference Counts, Shared and Recursive Lists.

UNIT- V

Trees: Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

TEXT BOOKS:

1. "Data structures, Algorithms and Applications in C++", S. Sahni, University Press (India) Pvt. Ltd, 2nd edition.
2. "Data structures and Algorithm Analysis in C++", Mark Allen Weiss, Pearson Education Ltd., 2 nd edition.
3. "Data structures and Algorithms in C++", Michael T. Goodrich, R. Tamassia and Mount, John Wiley and Sons, Wiley student edition.

REFERENCE BOOKS:

1. "Data structures and algorithms in C++", 3rd Edition, Adam Drozdek, Thomson.
2. "Data structures using C and C++", Langsam, Augenstein and Tanenbaum, PHI.
3. "Problem solving with C++ The Object of Programming", W.Savitch, Pearson education, Fourth edition.

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