

23CS1201–DATA STRUCTURES

(Common to CSE, IT, AI&DS, and allied branches)

Course Category:	Professional core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practical:	3-0-0
Prerequisite:	Knowledge in programming languages.	Sessional Evaluation:	30
		Univ.Exam Evaluation:	70
		Total Marks:	100
Objectives	<ul style="list-style-type: none"> • To provide the knowledge of data structures and supporting implementations. • To understand the importance of data structures in the context of application development. • To apply various data structures as per the suitability for simple project development. 		

Course Outcomes	At the end of the course, Student will be able to	
	CO1	Explain the role of linear data structures in organizing and accessing data efficiently.
	CO2	Apply linked lists for dynamic data storage, demonstrating the understanding of memory allocation and solve a few related problems.
	CO3	Learn the fundamentals of stacks and Queues to handle simple applications.
	CO4	Devise the solutions to small scale programming challenges involving data structures such as Trees, Binary search trees and AVL trees.
	CO5	Learn the fundamentals of graphs and recognize scenarios where hashing is an advantage, and design hash-based solutions for specific problems.
Course Content	<u>UNIT - I</u>	
	<p>Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.</p> <p>Searching Techniques: Linear and Binary Search.</p> <p>Sorting Techniques: Bubble sort, Selection sort, and Insertion Sort.</p>	
	<u>UNIT - II</u>	
	<p>Linked Lists: Singly linked lists - representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.</p>	
<u>UNIT - III</u>		
<p>Stacks: Introduction, properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, balanced parentheses, reversing list etc.</p> <p>Queues: Introduction, properties and operations, implementing queues using arrays and linked lists, Queue applications in OS and simulation experiments.</p> <p>Types of Queues: Types - Circular Queues, Priority Queues, Deques, and supporting operations.</p>		
<u>UNIT - IV</u>		
<p>Trees: Introduction, Types and basic properties.</p> <p>Binary trees – Definition, Tree traversals, Tree representations,</p> <p>Binary Search Trees – Definition, properties and applications</p> <p>AVL trees: Introduction and basic operations</p> <p>Heap – Introduction and types, Heap sort.</p>		

	<p style="text-align: center;"><u>UNIT - V</u></p> <p>Graphs: Introduction, Basic terminologies, Graph Representations, Bi-connected components, Topological sorting.</p> <p>Hashing: introduction to hashing and hash functions, basic implementation and operations of Hash tables, Caching, Collision resolution techniques - chaining and open addressing.</p>
<p>Text Books and References</p>	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition. 2. Data Structures, Algorithms, and Software Principles in C, by <u>Thomas A Standish</u>, ADDISON-WESLEY PUBLISHING COMPANY, 1995. 3. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008 <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders 2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft 3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum 4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein 5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.