

Data Structures and Algorithms	L	T	P	Programming Fundamentals	
	3	0	2		
Course Objective: This course introduces fundamental data structures and algorithms, focusing on their design, implementation, and application. Students will learn to optimize time-space complexity while exploring arrays, linked lists, stacks, queues, trees, graphs, sorting, searching, and file structures.					
S. NO	Course Outcomes (CO)				
CO1	Understand and apply basic algorithm concepts, including time-space complexity and operations on arrays and strings.				
CO2	Implement and utilize linked lists, including singly, circular, and doubly linked lists, for various applications.				
CO3	Understand and apply tree structures and operations, including binary search trees and AVL trees, to solve computational problems.				
CO4	Implement and analyze various searching and sorting algorithms for efficient data management				
CO5	Understand and implement graph traversal techniques and apply them to real-world problems like shortest paths and network analysis				

CO6	Apply file organization, indexing, and hashing techniques for efficient data storage and retrieval.
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S. NO	Contents	Contact Hours
UNIT 1	<p>Introduction: Introduction to Algorithms, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation and applications. Introduction to List data structure.</p> <p>Arrays and Strings: Representation of Arrays in Memory: one dimensional, Two dimensional and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion and Searching. Sorting elements of arrays. Strings and String Operations.</p> <p>Stacks and Queues: Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks : recursion, Polish expression and their computation, conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues.</p>	8
UNIT 2	<p>Linked Lists: Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, Applications of Linked List. Concepts of Circular linked list and Doubly linked list and their Applications. Stacks and Queues as linked list.</p>	7
UNIT 3	<p>Trees: Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching , Insertion and Deletion , Applications of Binary search Trees , Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B-trees.</p>	8
UNIT 4	<p>Searching and Sorting: Linear Search, Binary search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, External sorting.</p>	8
UNIT 5	<p>Graphs: Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path and Transitive Closure, Activity Networks, Topological Sort and Critical Paths.</p>	7
UNIT 6	<p>File Structure: File Organization, Indexing & Hashing, Hash Functions, Collision Resolution Techniques.</p>	4
	TOTAL	42

REFERENCES		
S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	"Schaum's Outline of Data Structures with C++" by John R. Hubbard MGH	2019
2	"Fundamentals of Data structures", Horowitz and Sahni, Galgotia publications	1983
3	"Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein MIT	4th Edition (2022)
4	"Data Structures", Tannenbaum, PHI	2007

B.Tech. Information Technology				
Course code: Course Title	Course Structure			Pre-Requisite
Information and Network Security	L	T	P	Computer Networks, Operating Systems, Basic Programming
	3	1	0	

Course Objective: 1) To provide students with a comprehensive understanding of the principles and practices