Program	Bachelor of Technology (B.Tech)		**Semester - 3**
Type of Course	-		
Prerequisite			
Course Objective	-		
Effective From A.Y.	2025-26		

Teaching Scheme (Contact Hours)				Examination Scheme				
Lecture	**Tutorial**	**Lab**	**Credit**	Theory Marks		Practical Marks		**Total Marks**
				SEE TH	**IAT**	**SEE P**	**CCE**	
3	0	2	4	70	-	50	-	170

SEE - Semester End Examination, *IAT* - Internal Assessment Test, *CCE* - Continues & Comprehensive Evaluation

Course Content				

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**Introduction to Data Structure:** Data, Data types, Abstract Data types (ADT), Types of Data Structure: Linear, Non-linear data Structures, Characteristics of an algorithm, analyzing programs, Performance Analysis and Measurement (Time and space analysis of algorithms -Average, best and worst case analysis).	4	10
2	**Stack and Queue** Stack: Definitions & Concepts, Operations on Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression and their compilation, Recursion, Application: Factorial, Fibonacci Series, Tower of Hanoi. Queue: Basic of Queue, Representation of Queue, Operations on Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue.	9	20
3	**Linked List:** Introduction, Representation of Linked List, Singly Linked List, Doubly Linked list, Circular linked list, Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.	9	20
4	**Tree:** Introduction, Tree : Definitions and Concepts, Representation of binary tree, Binary tree traversal: Inorder, postorder, preorder, Conversion of General tree to binary tree, Binary search trees, Operation of Binary Search Tree, AVL Tree (Height Balanced), Threaded binary tree, Weight Balance Tree, Applications Of Trees: B-tree, 2 -3 trees.	9	20
5	**Graph:** Graph Definition & Terminology, Matrix Representation of Graph, Elementary Graph operations, Traversing a Graph: Breadth First Search, Depth First Search, Applications of Graph: Minimum Spanning Trees-Prim's, Kruskal's algorithms, Dijkstra's shortest path algorithm, Boruvka's algorithm for Minimum Spanning Tree	9	20
6	**Advance Data Structures:** Tries, Suffix Trees, Hashing, Skip Lists, Disjoint Sets and Union-Find	5	10
	Total	45	100

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	20	30	30	20	0	0

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:

CO1	Understand the classification of data structures and analyze algorithm efficiency using time and space complexity.
CO2	Apply stack and queue concepts for solving problems like expression evaluation, recursion simulation, and task scheduling.
CO3	Implement and manipulate linear data structures such as arrays, singly, doubly, and circular linked lists to store and manage data dynamically.
CO4	Construct and traverse tree structures including binary trees, binary search trees, and perform balancing operations using AVL trees.
CO5	Represent graphs and apply graph traversal and path finding algorithms such as BFS, DFS, Dijkstra, and MST algorithms (Prim's & Kruskal's).
CO6	Understand the need and applications of advanced data structures in software and system development.

CO PO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PO - 1						
PO - 2						
PO - 3						
PO - 4						
PO - 5						
PO - 6						
PO - 7						
PO - 8						
PO - 9						
PO - 10						
PO - 11						

CO PSO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PSO - 1	-	-	-	-	-	-
PSO - 2	-	-	-	-	-	-
PSO - 3	-	-	-	-	-	-

Reference Books

1.	Ellis Horowitz, Sartaj Sahni − Fundamentals of Data Structures in C, University Press, 2nd Edition, ISBN: 978-81-7371-606-5, 2008. (TextBook)
2.	Jean -Paul Tremblay & Paul G. Sorenson Publisher, "An Introduction to Data Structures with Applications", 2nd Edition,Tata McGraw Hill.
3.	Ten Baum Publisher, "Data Structures using C & C++", 2nd Edition, Prenctice-Hall International.
4.	Gilberg & Forouzan, "Data Structures: A Pseudo-code approach with C", 2nd Edition, Thomson Learning.
5.	Rohit Khurana, "Data & File Structure",Second Edition,Vikas Publication, 2nd Edition 2012

List of Practical

1.	Write a C program to perform matrix multiplication using array.
2.	(a) Write a C program to create a stack using an array and perform: (i) push operation (ii) pop operation (iii) Display (b) Write a C program to create a queue and perform: (i) Insert (ii) Delete (iii) Display
3.	Write a C program that uses Stack operations to perform the following: i) Converting infix expression into postfix expression ii) Evaluating the postfix expression
4.	Write a C program that uses functions to perform the following operations on a Single linked list: (i) Creation (ii) Insertion at both ways (iii) Deletion from both ways (iv) Display
5.	Write a C program that uses functions to perform the following operations on Double linked list: (i) Creation (ii) Insertion (iii) Deletion
6.	Write a C program that uses functions to perform the following operations on Binary Tree: (i) Creation (ii) Insertion (iii) Deletion
7.	Write C programs that use both recursive and non-recursive functions to perform the Linear search operation.
8.	Write C program that use both recursive and non-recursive functions to perform the Binary search operation.
9.	Implement a Tree to insert and search words in a dictionary.
10.	Write a program to store k keys into an array of size n at the location computed using a hash function, loc = key % n, where k<=n and k takes values from [1 to m], m>n. To handle the collisions use the following collision resolution techniques: a. Linear probing b. Quadratic probing