Semester	3
Program	B.Sc. Computer Science (Hons.)
Course	DATA STRUCTURES
Paper Code	C2CS230312T
No. of Credits	4
Hours / week	Theory: 3, Practical: 2
Category: Core/MDC/SEC/VAC	Core
Theory/ Practical / Composite	Composite
Number of Modules	One
Course Overview: This course is meant to make the students understand the fundamental aspects of the data structures and their implementations in C along with the ways to analyze their efficiencies for solving computational problems. It covers linear structures (arrays, linked lists, stacks, queues) and non-linear structures (trees, graphs), alongside algorithm analysis using asymptotic notations.	
Course Outcomes	**CO1.** Understand fundamental concepts of data structures and analyze algorithm complexity **CO2.** Apply linear data structures (arrays, linked lists, stacks, queues) to solve computational problems **CO3.** Analyze tree structures and their applications in problem solving **CO4.** Evaluate and compare searching and sorting techniques for efficiency

Syllabus

Unit/Module	Content	Hours	CO Mapping	Cognitive Level
1	Concept of different data structures, ADT	2	CO1	K1, K2 (Remember, Understand)
2	Basic ideas on complexity analysis, Big-Oh, Small-Oh, Big-Omega, Small Omega, Big-Theta notations	2	CO1, CO4	K1, K2, K3, K4 (Remember, Understand, Apply, Analyze)
3	Different representation and applications of array, address translation	2	CO1, CO2	K1, K2, K3 (Remember, Understand, Apply)
4	Linear and binary searches, advantages and disadvantages	3	CO1, CO4	K1, K2, K3, K4 (Remember, Understand, Apply, Analyze)
5	Representation of linked lists,	6	CO1, CO2	K1, K2, K3 (Remember,

	different types, different operations on each of the types			Understand, Apply)
6	Definition of stack, array and linked list representations of stack, reverse polish notation	3	CO1, CO2	K1, K2, K3 (Remember, Understand, Apply)
7	Definition of queue, array and linked list representations of queue, different types	3	CO1, CO2	K1, K2, K3 (Remember, Understand, Apply)
8	Definition of binary tree, quantitative properties, types, array and linked representation, different traversals, definition of threaded binary tree, advantages	7	CO3	K2, K3, K4 (Understand, Apply, Analyze)
9	Definition of binary search tree, properties, different operations, definition and properties of AVL tree	4	CO3, CO4	K2, K3, K4 (Understand, Apply, Analyze)
10	Different sorting algorithms – Bubble, Selection, Insertion, Shell, Merge, Quick and Heap	7	CO4	K3, K4 (Apply, Analyze)
Text Books				
1. Fundamentals of Data Structures in C by Horowitz and Sahni				
2. Data Structures using C – Reema Thareja				
3. Data Structures Through C in Depth – Srivastava and Srivastava				

4. Data Structures and Program Design in C - R. L. Kruse, B.P. Leung		
5. Data Structures with C – S. Lipschutz		
Suggested Readings		
1. Data Structures using C – A. M. Tenenbaum		
Web Resources		
1. NPTEL course on Data Structures and Algorithm Design by Prof. Nitin Saxena, IIT Kanpur; course link: https://youtu.be/iATVLhyd44Q?si=aZddcOQ6SmQQlg7P		
Evaluation	Theory CIA: 12 Attendance: 3 Semester Exam: 45	Practical CA: 38 Attendance: 2
Paper Structure for Theory Semester Exam Module: Answer 3 out of 5 of 15 marks each		

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive Levels
CO1	Understand fundamental concepts of data structures and analyze algorithm complexity	K1, K2 (Remember, Understand)
CO2	Apply linear data structures (arrays, linked lists, stacks, queues) to solve computational problems	K3 (Apply)
CO3	Analyze tree structures and their applications in problem solving	K2, K3, K4 (Understand, Apply, Analyze)
CO4	Evaluate and compare searching and sorting techniques for efficiency	K3, K4 (Apply, Analyze)