DEPARTMENT OF COMPUTER / INFORMATION SCIENCE AND ENGINEERING			
Choice Based Credit System (CBCS) SEMESTER -VI			
Introduction to Data Structures (3:0:0) 3 (Effective from the academic year 2023-24)			
Course Code	21CS655	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

 This course will enable students to:
1. Learn and identify different data structures in C programming language.
2. Assess the use of suitable data structures in problem-solving.
3. Implement the usage of data structures using C programming language.
4. Develop solutions for practical problems.

Module – I

C Recap: Pointers.

Data Structures: Introduction, Classification, Operations.

Arrays: Declarations, Accessing/Storing of Elements, Operations, Passing arrays to Functions, Pointers and Arrays, Arrays of Pointers. Sorting (selection, insertion, bubble), and searching (Linear, Binary), Programming Examples. **Dynamic memory allocation**.

Text book 1: 1.11, 2.1-2.3, 3.1-3.8, 14.1-14.3, 14.7-14.9. **Textbook 2:** 1.2.2.

(8 hours)

Module – II

Structures: Introductions, Nested Structures, Arrays of Structures, Structures and Functions, Self-referential Structures.

Linked Lists: Definition, Representation of linked lists in Memory, Singly Linked List, **Linked list operations**: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, Circular Doubly Linked List—programming Examples.

Textbook 1: 5.1-5.5, 6.1-6.5.

(8 hours)

Module – III

Stacks: Definition, Stack Operations, Array Representation of Stacks, Linked representation of Stacks, Operations on Linked Stack, Programming Examples.

Recursion: Factorial, GCD, Fibonacci Sequence, Tower of Hanoi.

Text Book 1: 7.1-7.5, 7.7.4.	
	(8 hours)

Module – IV
Queues: Introduction, Array representation of Queues, Linked representation of Queues, Types of Queues, Applications of Queues (Excluding Josephus Problem), Programming Examples.
Text Book 1: 8.1-8.5.
(8 hours)

Module – V
Trees: Introduction, Types of Trees, Creating a Binary Tree, Binary Tree Traversals - Inorder, postorder, preorder, Level Order.
Binary Search Trees: BST create, Insert, and search -, Programming Examples.
Graphs: Introduction, Terminologies, Directed graphs, Matrix and Adjacency List Representation of Graphs, Breadth First Search, Depth First Search - Programming Examples.
Text Book 1: 9.1-9.4, 10.1, 10.2.1, 10.2.2, 10.2.3, 13.1-13.3, 13.5, 13.6.
(8 hours)

Course outcomes:
CO1: Understand the concepts of data structures.
CO2: Implement data structures using C Programming language.
CO3: Apply various data structures in problem-solving using C language.
CO4: Design and develop solutions using Data Structures for practical problems.

Textbooks	
1.	Reema Thareja, Data structures using C, 2nd Ed, Oxford University Press.
2.	Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.

References	
1.	Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014