22UCSC300	Data Structures and Applications	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- Working of various basic data structures and their implementation.
- Implementation issues of data structure in programming language.
- Selection of the appropriate data structure for solving a given problem.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs(13-16)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Write** programs to solve simple problems using stack and **explain** its working principles.	-	14	1,3,15,16
CO-2	**Write** programs to solve problems using queue and **explain** its working principles.	-	14	1,3,15,16
CO-3	**Write** programs to solve problems using Linked Lists and **explain** its working principles.	-	14	1,3,15,16
CO-4	**Write** programs to solve problems using trees and **explain** its working principles.	-	14	1,3,15,16
CO-5	**Write** programs to solve problems using advanced concepts of trees.	-	14	1,3,15,16

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Mapping Level	1.0	-	1.0	-	-	-	-	-	-	-	-	-	-	2.0	1.0	1.0

Pre-requisites: Problem Solving skills and knowledge of Programming in C language.

Contents:

Unit-I

Revision of Functions, Structures, Unions and Pointers
Stack: Realization of stack and its operations using static implementation. Applications of stacks – Polish Notation, Evaluation of Postfix Expression, Infix to Postfix Expression, Recursion – Factorial, GCD, Fibonacci Sequence, Towers of Hanoi. **12 Hrs**

Unit-II

Queues: Definition, Array representation, Basic operations, Types of Queues – Circular Queue, Dequeue, Priority Queue, Multiple Queues. Applications. **10 Hrs**

Unit-III

Linked Lists: Definition, Representation of linked list in memory, Memory allocation and deallocation, Operations – Traversing, Searching, Insertion, and Deletion. Types – Doubly Linked List, Circular Linked List, Linked List with header nodes. Stack and Queue implementation using list, Applications – Polynomial evaluation, Sparse Matrix representation. **10 Hrs**

Unit-IV

Trees - 1: Definition, Binary Trees and Binary Search Trees – Definitions, Representations, Insertion, Traversals. Application – Expression tree **10 Hrs**

Unit-V

Trees - 2: AVL tree, 2-3 tree, 2-3-4 tree, B-tree. **10 Hrs**

Reference Books:

1) Aaron M. Tenenbaum, Yedidyah Langsam & Moshe J. Augenstein, “Data Structures using C and C++”, Pearson Education, 2006
2) Thomas H.Cormen, Charles E.Leiserson & Ronald L. Rivest, “Introduction to Algorithms”, 2/E, Prentice Hall of India, 2003.
3) E. Balagurusamy, “Programming in ANSI C”, 7/E, Tata McGraw-Hill, 2016
4) Behrouz A. Forouzan & Richard F. Gilberg, “Computer Science: A Structured Programming Approach Using C”, 2/E, Cengage Learning, 2003.