ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER   **COMPUTER SCIENCE** TIME:3HRS/WEEK

CS-Ma2-3601(3) **DATA STRUCTURES USING C** MARKS:60

w.e.f 2024-2025 (23AK Batch) **SYLLABUS**

**COURSE OBJECTIVES:**

To introduce the fundamental concept of data structures and to emphasize the importance of various data structures in developing and implementing efficient algorithms.

**COURSE OUTCOMES:** Students after successful completion of the course will be able to:

1. Define the concepts related to Data Structures and develop efficient algorithms for solving a problem. [L1].
2. Design and implement linked list concepts.[L6].
3. Discuss basic operations on stacks and queues using array representation. [L6].
4. Design and implement sorting and searching techniques, Summarize the characteristics and applications of different graph traversal techniques [L2,L6].
5. Identify different types of trees and their characteristics.[L3].

**UNIT- I: Basic Concepts:** Pointers and dynamic memory allocation, Algorithm-Definition and characteristics, Algorithm Analysis-Space Complexity, Time Complexity, Asymptotic Notation

**Introduction to Data structures:** Definition, Types of Data structure, Abstract Data Types (ADT), Difference between Abstract Data Types, Data Types, and Data Structures.

**Arrays**-Concept of Arrays, Single dimensional array, Two dimensional array, Operations on arrays with Algorithms (searching, traversing, inserting, deleting)

**UNIT- II: Linked List:** Concept of Linked Lists, Representation of linked lists in Memory, Comparison between Linked List and Array, Types of Linked Lists - Singly Linked list, Doubly Linked list, Circularly Singly Linked list, Circularly Doubly Linked list. **Implementation of Linked List ADT:** Creating a List, Traversing a linked list, Searching linked list, Insertion and deletion into linked list (At first Node, Specified Position, Last node), Application of linked lists

**UNIT- III: Stacks:** Introduction to stack ADT, Representation of stacks with array and Linked List, Implementation of stacks, Application of stacks - Polish Notations - Converting Infix to Post Fix Notation - Evaluation of Post Fix Notation - Tower of Hanoi, Recursion: Concept and Comparison between recursion and Iteration

**Queues:** Introduction to Queue ADT, Representation of Queues with array and Linked List, Implementation of Queues, Application of Queues Types of Queues- Circular Queues, De-queues, Priority Queue

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**UNIT- IV: Searching:** Linear or Sequential Search, Binary Search and Indexed Sequential **Search Sorting:** Selection Sort, Bubble Sort, Insertion Sort, Quick Sort and Merge Sort

**UNIT- V: Binary Trees:** Concept of Non- Linear Data Structures, Introduction Binary Trees, Types of Trees, Basic Definition of Binary Trees, Properties of Binary Trees, Representation of Binary Trees, Operations on a Binary Search Tree, Binary Tree Traversal, Applications of Binary Tree.

**Graphs:** Introduction to Graphs, Terms Associated with Graphs, Sequential Representation of Graphs, Linked Representation of Graphs, Traversal of Graphs (DFS, BFS), Application of Graphs.

**Text Books:**

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.

2. A.K. Sharma ,Data Structure Using C, Pearson Education India.

3. “Data Structures Using C” Balagurusamy E. TMH

**Reference Books:**

1. “Data Structures through C”, Yashavant Kanetkar, BPB Publications

2. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.

3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .

4. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.

**SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:**

**Unit 1: Activity:** Algorithm analysis exercises Evaluation Method: Programming Assignment and Correctness

**Unit 2: Activity:** Presentations on real-life applications of linked lists

Evaluation Method: Presentation skills or reports

**Unit 3: Activity:** Role-playing activities for stack operations

Evaluation Method: Problem-solving skills, communication and collaboration abilities.

**Unit 4: Activity:** Sorting algorithm analysis and comparison activities

Evaluation Method: Performance analysis and presentation.

**Unit 5: Activity:** Case Study on Applications of Graphs

Evaluation Method: Critical thinking, problem-solving, and presentation skills

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