

CSE102 Fundamentals of Data Structures and Algorithms

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Version No. : 1.0

Course Prerequisites: Computer Programming and Problem Solving

Objectives

The course aims to introduce the concept of arrays, recursion, stack, queue, linked list, trees and graph data structures.

Expected Outcome

On completion of subject the students will be able to apply

- The concept of arrays, structures pointers and recursion
- The concepts of stack, queue and linked list concepts
- Trees, representation of trees, tree traversal and basic operations on trees to any algorithm
- Some of the sorting and searching techniques
- The concept of graphs, traversal techniques and minimum spanning tree

Unit 1 Advanced C Programming Concepts INTRODUCTION TO DATA STRUCTURES

Pointers in C - Arrays in C - One dimensional array - Passing Array as parameters - Two dimensional array - Structures in C - Implementing structures - Passing Structure as parameters - Allocation of storage and scope of variables. Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

Unit 2 Introduction to basic Data Structures STACK, QUEUE AND LINKED LIST

Abstract Data Types - Stack definition and examples – Array Implementation of Push and pop operation - Stack Applications. Queue Array Implementation of enqueue and dequeue operations - Queue Application: Priority queue - Array implementation of priority queue. List, Stack, Queue - Singly linked implementation.

Unit 3 TREES

Introduction to Trees - Terminologies - Binary trees: Operations on binary trees - Applications of binary trees - Binary tree representation - Node representation of binary trees - Implicit array representation of binary tree – Linked Representation of Binary trees - Binary tree traversal - Binary Search Trees- Counting the number of nodes in a BST - Searching for an element in BST - Deleting a node from BST.

Unit 4 SORTING AND SEARCHING

General background of sorting, Efficiency considerations, Notations, Efficiency of sorting. Exchange sorts: Bubble sort; Quick sort; Selection sort; Heap sort. Heap as a priority queue - Insertion sorts: Simple insertion - Shell sort - Merge sort - Sequential search: Indexed sequential search - Binary search.

Unit 5 GRAPHS

Introduction to Graphs - Terminologies - Array representation of graphs - Transitive closure - Warshall's algorithm – Linked representation of graphs - Dijkstra's algorithm - Graph traversal - Traversal methods for graphs - Undirected graph and their traversals - Depth first traversal - Application of depth first traversal - Breadth first traversal - Applications of BFS - Applications of Graphs - Minimum spanning tree - Prim's Algorithm - Kruskal's algorithm.

TextBooks

1. P. S. Deshpande, O. G. Kakde, 'C & Data Structures', Charles River Media Computer Engineering, 2004.

Reference Books

1. E. Balagurusamy, 'Programming in Ansi C', Second Edition, Tata McGraw Hill Publication, 2003.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.

Mode of Evaluation: Sessional – Written CAE-I & II and Assignments & Attendance
Final – Written Term - End Examination (TEM)

Recommended by the Board of Studies on:

Date of approval by the Academic Council:

CSE102 Fundamentals of Data Structures and Algorithms Laboratory

1. Array Implementation
 - a) Stack
 - b) Queue
 - c) List
 - d) Priority Queue
 - e) Circular Queue
2. Linked Implementation
 - a) Stack
 - b) Queue
 - c) List
 - d) Priority Queue
3. Applications of linear data structures
 - a) Infix to Postfix conversion
 - b) Expression evaluation
4. Trees
 - a) Binary Tree Implementation
 - b) BST implementation
5. Graphs
 - a) Breadth first searching (BFS)
 - b) Depth first searching (DFS)
6. Sorting techniques
 - a) Bubble sort
 - b) Selection Sort
 - c) Insertion Sort
 - d) Shell Sort
 - e) Merge sort
 - c) Quick sort
7. Searching techniques
 - a) Binary search
 - b) Linear search
 - c) Indexed Sequential Search

Mode of Evaluation: Record Book, Viva- Voce and Term End Exam.