CSE205: DATA STRUCTURES AND ALGORITHMS

L: 3 T : 0 P : 2 Credits: 4

Course Outcomes: Through this course students should be able to

CO1 :: describe the process to find efficiency of algorithms using asymptotic notations.

CO2 :: develop skills to compare various data structure algorithms.

CO3 :: illustrate the importance of data structures in context of writing efficient programs.

CO4 :: identify appropriate data structures in problem solving.

CO5 :: recommend to improve existing code using learned algorithms and data structures.

CO6 :: construct new solutions for programming problems.

Unit I

Introduction: Basic Data Structures, Basic Concepts and Notations, Complexity analysis: time space and trade off, Omega Notation, Theta Notation, Big O notation

Arrays: Linear arrays: memory representation, Traversal, Insertion, Deletion, Searching, Merging and their complexity analysis.

Sorting and Searching: Bubble sort, Insertion sort, Selection sort

Unit II

Linked Lists: Introduction, Memory representation, Allocation, Traversal, Insertion, Deletion, Header linked lists: Grounded and Circular, Two-way lists: operations on two way linked lists

Unit III

Stacks: Introduction: List and Array representations, Operations on stack (traversal, push and pop), Arithmetic expressions: polish notation, evaluation and transformation of expressions

Queue: Array and list representation, operations (traversal, insertion and deletion), Priority Queues, Deques

Unit IV

Recursion: Introduction, Recursive implementation of Towers of Hanoi, Merge sort, Quick sort
Trees : Binary trees - introduction (complete and extended binary trees), memory representation (linked, sequential), Pre-order traversal, In-order traversal, Post-order traversal using recursion, Binary Search Tree- searching, insertion, deletion

Unit V

AVL trees and Heaps: AVL trees - introduction, AVL trees Insertion, AVL trees Deletion, Heaps - Insertion, Heapify, Deletion, Heap Sort, Huffman algorithm

Unit VI

Graphs: Warshall's algorithm, Shortest path algorithm Floyd Warshall Algorithm (modified Warshall algorithm), Graph Traversal: BFS, DFS

Hashing : Hashing Introduction, Hash Functions, Hash Table, Closed hashing (open addressing), Linear Probing, Quadratic Probing, Double Hashing, Open hashing (separate chaining)

List of Practical:

Arrays: Program to implement insertion and deletion operations in arrays

Searching: Program to implement different searching techniques - linear and binary search

Sorting: Program to implement different sorting techniques – bubble, selection and insertion sort

Linked List: Program to implement searching, insertion and deletion operations in linked list

Doubly Linked List: Program to implement searching, insertion and deletion operations in doubly linked list

Stacks: Program to implement push and pop operations in stacks using both arrays and linked list

Yet need to do it

Queues: Program to implement enqueue and dequeue operations in queues using both arrays and linked list

Recursions: Program to demonstrate concept of recursions with problem of tower of Hanoi

Recursive Sorting: Program to implement recursive sorting techniques - merge sort, quick sort

Trees: Program to create and traverse a binary tree recursively

Binary Search Tree: Program to implement insertion and deletion operations in BST

Heaps: Program to implement insertion and deletion operations in Heaps and Heap Sort

Text Books:

1. DATA STRUCTURES by SEYMOUR LIPSCHUTZ, MCGRAW HILL EDUCATION

References:

1. DATA STRUCTURES AND ALGORITHMS by ALFRED V. AHO, JEFFREY D. ULLMAN AND JOHN E. HOPCROFT, PEARSON