CSE205:DATA STRUCTURES AND ALGORITHMS

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

Course Outcomes: Through this course students should be able to

CO1:: understand the time and space complexity of programs and data-structures.

CO2:: illustrate the importance of Linked List in context of real world problems

CO3 :: differentiate the Stack and Queue data structures for problem solving

CO4:: use of recursion in iteration process and tree data structure

CO5 :: analyze the effectiveness of AVL Tree and Heap Data Structures

CO6:: use of Graph and Hashing techniques in problem solving

Unit I

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

Arrays: Linear arrays: memory representation, Array operations: traversal, insertion, deletion, sorting, searching and 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

Trees: Binary trees: introduction (complete and extended binary trees), memory representation (linked, sequential), Binary Search Tree: introduction, searching, insertion and deletion, In-order traversal, Pre-order traversal, Post-order traversal using recursion

Recursion: Introduction, Recursive implementation of Towers of Hanoi, Merge sort, Quick sort

Unit V

AVL trees and Heaps: AVL trees Introduction, AVL trees Insertion, AVL trees Deletion, Heaps: Insertion, Heaps: Deletion, HeapSort, Huffman algorithm

Unit VI

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

Hashing: Hashing introduction: hash functions, hash table, Open hashing (separate chaining), Closed hashing (open addressing): linear probing, quadratic probing and double hashing.

List of Practicals / Experiments:

Array

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

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Doubly Linked List

• Program to implement searching, insertion and deletion operations in doubly linked list

Stack

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

Oueues

• 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

Tree

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

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