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 :: apply heap operations and hashing techniques for efficient data storage, retrieval, and collision resolution.

CO6 :: identify and integrating emerging data structures and algorithmic ensuring their ability to stay with technological advancements and maintain professional growth in a dynamic field

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, Searching: Linear Search and Binary Search

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

Unit V

Heaps and Hashing : Heaps: Introduction, Insertion, Deletion, HeapSort, Hashing introduction: hash functions, hash table, Open hashing (separate chaining), Closed hashing (open addressing): linear probing, quadratic probing and double hashing

Unit VI

Graphs : Graph Traversal: BFS, DFS, Shortest path algorithm: Dijkstra's Algorithm, Bellman-Ford Algorithm, Floyd Warshall Algorithm

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

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

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

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