CAP770:ADVANCED DATA STRUCTURES

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

Course Outcomes: Through this course students should be able to

CO1 :: understand the concepts of abstract data type and algorithm complexity

CO2 :: apply suitable data structure for solving problems

CO3 :: examine the working of hashing and collision resolution techniques

CO4 :: analyze the performance of various algorithms

Unit I

Introduction : need of data structures and algorithms, time and space complexity of algorithms, asymptotic notations, average and worst case analysis, arrays vs linked lists, operations on arrays and linked lists.

Unit II

Stacks and Queues : implementation of stacks, applications of stacks: quick sort, parenthesis checker, arithmetic expression conversion and evaluation, tower of Hanoi problem, role of stack in recursion, implementation of queues, priority queue, applications of queues

Unit III

Search trees : binary search trees: searching, insertion and deletion operations, AVL trees: balancing operations, b-trees: properties and operations, red-black trees, splay trees: properties and operations, 2-3 trees: properties and operations

Unit IV

Heaps : introduction to heaps, min heap, max heap, operations on heap, applications of heap: priority queue implementation, heap sort, binomial heaps, fibonacci heaps

Unit V

Graphs : type of graphs, adjacency matrix and linked adjacency chains, connected components and spanning trees, breadth first search, depth first search, network flow problems, warshall's algorithm for shortest path, topological sort

Unit VI

Hashing techniques : linear list representation, hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing

List of Practicals / Experiments:

Programs on

- Program to implement the concept of stacks
- Program to implement the concept of queues
- Program to implement the concept of search trees
- Program to implement the concept of heaps
- Program to implement the concept of graphs
- Program to implement the concept of hashing techniques

Text Books:

1. DATA STRUCTURES AND ALGORITHMS IN C++ by ADAM DROZDEK, THOMSON EDUCATIONAL PUBLISHING

References:

1. DATA STRUCTURES AND ALGORITHM ANALYSIS IN C by MARK ALLEN WEISS, ADDISON-WESLEY

2. DATA STRUCTURES AND ALGORITHMS by AHO, HOPCRAFT, ULLMAN, PEARSON

3. INTRODUCTION TO ALGORITHMS by THOMAS H., LEISERSON, CHARLES E., RIVEST, RONALD L., STEIN, CLIFFORD, PHI Learning