CSE523:ADVANCED DATA STRUCTURE AND ALGORITHMS

Course Outcomes: Through this course students should be able to

CO1 :: analyze the asymptotic performance of algorithms.

CO2 :: transfer from elementary to advanced concepts of data structures.

CO3 :: analyze the algorithmic solutions for resource requirements and optimization.

CO4 :: classify various forms of trees including heaps and multiway trees.

CO5 :: review reliable and flexible methods of data retrieval using hashing techniques.

CO6 :: understand the graph algorithms and variant of lists.

Unit I

Complexity Analysis and Recurrence Relations : Introduction and Need of Data Structures and Algorithms, Time and Space Complexity of Algorithms, Asymptotic Analysis, Asymptotic Notations, Average and Worst-Case Analysis, Amortized Complexity, Recurrence Relation for Time Complexity: Substitution Method, ,, Tree Method, Master Method

Unit II

Elementary to Advanced Data Structures : Multidimensional Arrays, Jagged Arrays and Pointer Arrays, Sparse Matrices, Doubly Linked List - Doubly Header Linked Lists, Doubly Linked Circular Lists, Doubly Circular Header Linked Lists, Operations on Doubly Linked Lists, Multi Linked Lists, Stacks: Notations for Arithmetic Expressions - Infix, Prefix, Postfix, Analysis of Quick sort algorithm, Queues: Array and Linked representation of Queue, Circular Queue, Double Ended Queue, Priority Queue and various representations of Priority Queue

Unit III

Data Compression and Memory Management : Conditions for Data Compression, Huffman Coding, Run-Length Encoding, Ziv-Lempel Code, Memory Management-The Sequential-Fit Methods, The Non-Sequential-Fit Methods, Garbage-Collection

Unit IV

Heaps and Multiway Trees : Basic operation on Binomial Heap, Insertion and Deletion in AVL Tree, Insertion and Deletion in Red Black Trees, Insertion and Deletion in B Tree, B* Tree, Insertion and deletion in B+ Tree, Basic operation on Heap, M-way Search Tree, Application of Trees and Heap

Unit V

Hashing, Rehashing And Extendible Files : Hash Functions, Collision Resolution, Perfect Hash Functions - Cichelli's Method, The FHCD Algorithm, Rehashing - The Cuckoo Hashing; Hash Functions For Extendible Files - Extendible Hashing, Linear Hashing; Bucket Hashing

Unit VI

Graph Algorithm and List Variants : Skip List, Self Organizing List, Sparse Tables, Graph Representation, Graph Types, Graph Traversal, Minimum Spanning Tree, Shortest Path Algorithm, Graph Coloring Algorithm

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 IN JAVA by MICHAEL T. GOODRICH, ROBERTO TAMASSIA, WILEY

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

4. INTRODUCTION TO ALGORITHMS by CORMEN, THOMAS H., LEISERSON, CHARLES E., RIVEST, RONALD L., STEIN, CLIFFORD, PHI Learning Pvt Ltd