DATA STRUCTURES AND ALGORITHMS

Course code: 13CS2101

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Pre requisites: Graph Theory, Design and Analysis of Algorithms, C

Course Educational Objectives:

Todeliver the programming Techniques which are advanced for solving. The problems regarding memory locations and also object oriented features.

Course Outcomes:

After the completion of the course, student will be able to

- Get the knowledge in linear and non-linear data structures.
- Get the knowledge to solve the problems regarding large data structures like stack, queue and heap, and gets good grip on pointers.
- Learn about various searching mechanisms with Red Bloc, AVL, B^+ trees & Graphs.
- Learn different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
- Learn a variety of advanced abstract data type (ADT) and data structures and their implementations.

UNIT-I

Lists, Stacks, Queues and Trees Lists, Stacks and Queues: Abstract Data Types (ADTs), The List ADT, Vector and list in the STI, Implementation of vector, Implementation of list, The Stack ADT, The Queue ADT. Trees: The Search Tree ADT – Binary Search Trees, AVI. Trees, Splay Trees, B-Trees.

UNIT-II

Hashing and Priority Queues Hashing: General idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Extendible Hashing Priority Queues: Implementations, Binary Heap, Applications of Priority Queues, *d*-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues.

UNIT-III

Sorting: A Lower Bound for Simple sorting Algorithms, Shellsort, Heapsort, Mergesort, Quicksort, Indirect Sorting, A General Lower Bound for sorting, Bucket Sort, External Sorting,

The Disjoint Set Class Equivalence Relations, The Dynamic Equivalence Problem, Basic Data Structure, Smart Union Algorithms, Path Compression, Worst Case of Union-by-Rank and Path Compression, An Application.

UNIT-IV

Graph Algorithms Definitions, Topological sort, Shortest-Path Algorithms, Network Flow Problems, Minimum Spanning Tree, and Applications of Depth-First Search. Greedy Algorithms, Divide and Conquer, Dynamic Programming, Randomized Algorithms, Backtracking Algorithms.

UNIT-V

Amortized Analysis An Unrelated Puzzle, Binomial Queues, Skew Heaps, Fibonacci Heaps, Splay Trees.Top-Down Splay Trees, Red-Black Trees, Deterministic Skip lists, AA-Trees, Treaps, *k*-d Trees, Pairing Heaps.

Text Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Pearson, 2007.

References:

1. Sartaj Sahni, "Data Structures Algorithms and Applications in C++", 2nd Edition, Universities Press, 2007.
2. Ellis Horowitz, Sartaj Sahni, S. Rajasekharan , "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, 2008.
3. A. V. Aho, J. D. Ullman, "Data Structures and Algorithms" , 1st Edition, Pearson Publication, 2003.
4. Adam Drozdek ; "Data Structures and Algorithms in C++", 3rd Edition, Cengage, 2006.
5. Horowitz Sahni, Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, University Press 2007.