2. Advanced Data Structures and Algorithms

L-T-P 3-0-0 Cr. - 3

Objective:

1. To understand the principles of Advanced Data Structure.
2. To be familiar with the advanced algorithms and their Implementation.

MODULE – I

Aamortized analysis, NP completeness – P, NP, NP-hard, NP Complete.P, NP, NP-Hard & NP-complete problems Trackablility - Intrackable, Decision, Optimization. Sample Problems in P - Fractional Knapsack, MST, Sorting. Sample Problems in NP - Fractional Knapsack, MST, Traveling Salesman, Graph Coloring, Satisfiability (SAT), NP Complete Problems.Reduction.

MODULE – II

Search, Heap and Multimedia Data Structures:2-3 trees, 2-3-4 trees, Red-blacktrees, Splay trees – Tries, Min-max heaps, Deaps, Leftist heaps, Binomial heaps,Fibonacci heaps, Skew heaps, Segment trees, k-d trees, Quad trees, R-trees.

MODULE – III

Applications: Set representation, Set union and find operations, counting binary treesHuffman coding, Topological sort, Garbage Collection and Compaction, Min cut -max flowalgorithm, Activity networks.

MODULE – IV

Online Algorithms: Basic Concepts, Optimization Problems, Competitive Analysis,Deterministic Algorithms, Optimum Offline Algorithms, CaseStudy - Ski Rental Problem. Approximation Algorithms: Basic Concepts, Bounds, Polynomial Time ApproximationSchemes, Hardness of Approximations, Case Study - Vertex Cover Problem, Travelling Salesman Problem.

Outcome:

1. Understand basic data structures and calculating complexity.
2. Gain an understanding of different heaps and multimedia data structure.
3. Understand the application of various data structure in solving real-time problems.
4. Understand online algorithms and randomised algorithms.
5. Understand approximation algorithms with case study.

Books Recommended:

1. Introduction to Algorithms, Thomas H.Corman, Charles E.Leiserson, Ronald L.Rivest, Second Edition, PHI 2003.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, PearsonEducation, 3rd Ed, 2007.
3. Online Computation and Competitive Analysis - A. Borodin and R. El-Yaniv,Cambridge Univ. Press, 1998.
4. Approximation Algorithms - Vijay V. Vazirani, Springer Verlag, 2003.