

DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE&IT)

II B. Tech. - II Semester
Course Code: A3CS11

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COURSE OVERVIEW:

The primary objective of this course is to introduce the concept of algorithm as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs. The course consists of a strong mathematical component in addition to the design of various algorithms

COURSE OBJECTIVES:

1. To demonstrate performance of algorithms with respect to time and space complexity.
2. To explain graph and tree traversals.
3. To explain the concepts greedy method and dynamic programming. Applying for several applications like knapsack problem, job sequencing with deadlines, and optimal binary search tree, TSP and so on respectively.
4. To illustrate the methods of backtracking and branch bound techniques to solve the problems like n-queens problem, graph colouring and TSP respectively.
5. To familiarize the concepts of deterministic and non-deterministic algorithms.

COURSE OUTCOMES:

At the end of this course students will be able to:

1. Identify various Time and Space complexities of various algorithms
2. Understand Tree Traversal method and Greedy Algorithms
3. Apply Dynamic Programming concept to solve various problems
4. Apply Backtracking, Branch and Bound concept to solve various problems
5. Implement different performance analysis methods for non deterministic algorithms

SYLLABUS

UNIT - I

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

UNIT - II

DIVIDE AND CONQUER: General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs.

GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

UNIT - III

GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points.

DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT - IV

BACKTRACKING: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles.

BRANCH AND BOUND: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

UNIT - V

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook's theorem.

TEXT BOOKS:

1. Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

REFERENCE BOOKS:

1. R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
2. Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
3. Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi