DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE & IT)

Course Code :13CT1108	L	T	P	C
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Course Educational Objectives:

This course aims to introduce the classic algorithms in various domains, and techniques for designing efficient algorithms, apply the algorithms and design techniques to solve problems and also analyze the complexities of various problems in different domains.

- The objective of this course is to cover key techniques for designing and analyzing algorithms.
- To implement various searching ,sorting and back tracking, dynamic programming algorithms with the knowledge of algorithm implementation
- Major techniques for algorithm design and analysis are introduced through the study of various algorithms.
- To design and analyze an algorithm for all kinds of real time problems.
- To analyze complex non deterministic problems.

Course Outcomes :

At the end of the course the student will be able to

- Measure the complexity of an algorithm, including best-case, worst-case, and average complexities as functions of the input size
- Classification in terms of asymptotic complexity classes.
- Learn the basic algorithmic design strategies, including recursion, divide-and-conquer, the greedy method, dynamic programming, and backtracking and branch-and bound.
- Know the different strategies that are known to be useful in finding efficient algorithms to solve problems and to be able to apply them.
- Know about non deterministic problems.

UNIT-I (15 Lectures)

INTRODUCTION:

Algorithm, Psuedocode for expressing algorithms, Performance Analysis-Space complexity,Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little ohnotation,Probabilistic analysis, Amortized analysis.

Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected componentsand biconnected components.

UNIT-II (12 Lectures)

DIVIDE AND CONQUER:

General method, applications-Binary search, Quick sort, Merge sort, Strassen'smatrix multiplication.

GREEDY METHOD: General method, applications-Job sequencing with dead lines, 0/1 knapsack problem,Minimum cost spanning trees, Single source shortest path problem.

UNIT-III (12 Lectures)

DYNAMIC PROGRAMMING:

General method, applications-Matrix chain multiplication, Optimal binary searchtrees, 0/1 knapsack problem, All pairs shortest path problem,Travelling sales person problem, Reliabilitydesign.

UNIT-IV (12 Lectures)

BACKTRACKING:

General method, applications-n-queen problem, sum of subsets problem, graph coloring,Hamiltonian cycles.

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsackproblem- LC Branch and Bound solution, FIFO Branch and Bound solution.

UNIT-V (10 Lectures)

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 and Rajasekharam, *"Fundamentals of Computer Algorithms"*, 2nd Edition,Univesity Press,2008.
2. M.T.Goodrich and R.Tomassia: *"Algorithm Design Foundations, Analysis and Internet examples"*, 1st Edition, John wiley and sons, 2006.

REFERENCES:

1. T.H.Cormen,C.E.Leiserson,R.L.Rivest,and C.Stein, "*Introduction to Algorithms"*, 3rd Edition, PHI / Pearson Education,2009.
2. R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, *"Introduction to Design and Analysis of Algorithms A strategic approach"*, 2nd Edition , Tata Mc Graw Hill,2009.
3. Allen Weiss, *"Data structures and Algorithm Analysis in C++"*, 2nd Edition, Pearson Education, 2009.
4. Aho, Ullman and Hopcroft, *"Design and Analysis of algorithms"*, 3rd Edition, Pearson Education, 2008.

WEB REFERENCES:

http://nptel.iitm.ac.in/courses/106101060/