ANALYSIS & DESIGN OF ALGORITHMS

Paper Code	**CEN-605**
Course Credits	**4**
Lectures / week	**3**
Tutorial / week	**1**
Course Description	**UNIT – I**

Introduction: What is algorithm? Why analyze algorithm? RAM Model of Computation. Best-case, worst-case and average-case complexity analyses. Asymptotic Notations: Big-Oh, Big-Omega, Theta notations, Small-oh, Small-omega notations, Rules of notations. Solving recurrence equations: Iterative method, Recursion-tree method, Guess method, Master method, Master's theorem, and proof of master's theorem. Rate of growth of functions and their ranking. Review and analysis of searching and sorting algorithms, lower bound of comparison-based sorting.

UNIT- II

Divide and Conquer Strategy: Introduction, Counterfeit coin detection, binary search, merge sort, quick sort, integer multiplication, matrix multiplication (Strassen's algorithm), exponentiation problem, polynomial multiplication, median-finding problem, closest pair of points problem. When to avoid divide-&-conquer strategy.

UNIT- III

Graph Algorithm: Introduction, topological sorting, Dijkstra's algorithm shortest path for weighted graph, DFS algorithm, BFS algorithm, articulation points in bi-connected graph, strongly connected components. Greedy Algorithm: Introduction, change-making problem, Huffman coding, Minimum spanning tree problem, disjoint set data structure, prims and kruskal algorithm, 0/1 knapsack problem, fractional knapsack problem, activity selection problem.

UNIT- IV

Dynamic Programming: Introduction, fibonacci series calculation, 0/1 knapsack problem, matrix chain multiplication, Longest common subsequence problem, optimal binary tree search problem, memoization, Floyd-Warshal's algorithm. Backtracking: The general method, 8-queen problem, sum of subsets.

UNIT – V

String Search Problem: Naïve algorithm, Rabin-karp algorithm, FSA based algorithm, knuth-morris-pratt algorithm. Complexity theory: P class of problem, NP-class of problem, Decidability of problems, Halting problem, Polynomial reduction problem, Cook's theorem, NP hardness and NP completeness.

References / Text Books:

- T H Cormen, C E Leisersor, and R L Rivest, Introduction to Algorithm, Third Edition, PHI.
- Richard Neapolitan and Kumarss Naimipour, Foundation of Algorithms, Fourtht Edition, Jones & Bartlet.
- A V Aho, J E Hopcroft and J D Ullman, The Design and analysis of computer algorithms, Pearson Education
- E Horwitz, and S Sahni, Fundamentals of Computer Algorithm, PHI
- Goodrich & Tamassia, Algorithm Design, Wiley
- A Levitin, Introduction to the Design & Analysis of Algorithms, 2nd Edition, Pearson Education.

Computer Usage / Software Requires:

- NPTEL Lectures for Algorithms
- MIT Open Courseware for Algorithms