

Course Code	ECAP538	Course Title	ALGORITHM DESIGN AND ANALYSIS		
			WEIGHTAGES		
			CA	ETE(Th.)	ETE (Pr.)
			30	40	30

Course Outcomes:

C01: perceive the need of different algorithm design techniques

C02: design and implement algorithms using divide and conquer, greedy approach, dynamic programming and backtracking

C03: apply specific algorithms for solving computational problems like pattern matching, minimum spanning tree and shortest-path problems

C04: analyze the asymptotic performance of algorithms

Unit No.	Content
Unit-1	Introduction: elementary data structures, basic computational models, analysis of algorithms: best case, average case and worst-case behaviour, asymptotic notations: big O notation, recursion, recurrence relations to analyse recursive algorithms
Unit-2	Divide and conquer: general method, binary search, merge sort, quick sort, and arithmetic with large integers.
Unit-3	Greedy method: General Method, Knapsack problem, Minimal Spanning Trees - Prim's and Kruskal's algorithm, single source shortest paths
Unit-4	Dynamic programming: general method, chained matrix multiplication, optimal storage on tapes
Unit-5	More on Dynamic programming: all-pairs shortest paths, optimal binary search trees
Unit-6	Backtracking: general method, the 8-queens problem, graph coloring, Hamiltonian cycles
Unit-7	Branch and bound: general method, 0/1 knapsack problem, travelling salesperson
Unit-8	Pattern matching: design of algorithms for pattern matching problems: brute force, knuth-morris-pratt, boyer moore algorithms
Unit-9	Huffman coding and data compression problems
Unit-10	Lower bound theory: comparison tree, oracles and adversary arguments
Unit-11	More on lower bound theory: lower bounds through reductions
Unit-12	Approximation: approximation basics, task scheduling, bin packing
Unit-13	Intractable problems: basic concepts, non-deterministic algorithms, NP completeness
Unit-14	More on intractable problems: examples of NP-hard and NP-complete problems, cook's theorem, problem reduction

LABORATORY WORK:

Implementation of algorithm design and analysis concepts (Divide and conquer, greedy method, dynamic programming, back tracking, branch and bound, pattern matching, lower bound theory, intractable problems)

READINGS:

1. Fundamentals of computer algorithms by E. Horowitz and S. Sahani, Galgotia publications
2. Design and analysis of algorithms by Himanshu B. Dave, Pearson
3. Design & analysis of algorithms by R.C.T. Lee, Mcgraw Hill Education
4. Design and analysis of computer algorithms by John E. Hopcroft, Addison-Wesley