VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
DESIGN AND ANALYSIS OF ALGORITHMS

B. TECH- IV Semester **L/T/P/C**
3/0 /0 /3

Prerequisites: Data Structures and Algorithms

Course Objectives:

- This course trains the students to study a few known methods of solution processes, build new solution algorithms, analyze the asymptotic performance of algorithms and to write rigorous correctness proofs for algorithms.
- Focus would be to make the students to choose the appropriate data structures and algorithm design methods for specified classes of applications.
- To understand how the choice of data structures and algorithm design methods would impact the performance of programs and how to compare them.
- Design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound; and methods to deal with logarithmic type, polynomial type and non-polynomial type of classes of problems.
- Synthesis of efficient algorithms in common engineering design situations would be discussed.

UNIT I:

Introduction: Algorithm, algorithm specifications, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Randomized analysis, Amortized analysis.

Disjoint Sets: Disjoint set operations, union and find algorithms**.**

UNIT II:

Divide and Conquer: General method, **Applications**-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication, Selection Problem.

Greedy method: General method, Applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III:

Dynamic Programming: General method, **Applications**-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design. Differences between Greedy method and Dynamic programming approaches**.**

UNIT IV:

Backtracking: General method, Applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles, connected components and biconnected components.

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, proofs-CLIQUE is NP Complete, NP completeness of Vertex covering problem.

Course Outcomes:

After the completion of this course, the students should be able to

CO-1: Expose student's to few known methods of solution processes, build new solution algorithms, analyze the asymptotic performance of algorithms and to write rigorous correctness proofs for algorithms.

CO-2: Identify appropriate data structures and algorithm design methods for specified classes of applications;