



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

DESIGN AND ANALYSIS OF ALGORITHMS								
IV SEMESTER : CSE / CSD / CSM								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2440508	Core	L	T	P	C	CIA	SEE	Total
		2	0	0	2	40	60	100
Contact Classes: 30	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 30			
Prerequisites: Data structures								

Course Overview:

Design and Analysis of Algorithms is a fundamental aspect of computer science that involves creating efficient solutions to computational problems and evaluating their performance. DSA focuses on designing algorithms that effectively address specific challenges and analyzing their efficiency in terms of time and space complexity.

Course Objectives:

1. Understand asymptotic analysis to evaluate the time and space efficiency of algorithms.
2. Learn algorithm design strategies for solving scientific and engineering problems efficiently.
3. Apply greedy and dynamic programming techniques to optimization problems such as knapsack, job sequencing, OBST, and TSP.
4. Understand and apply backtracking and branch-and-bound methods to solve combinatorial problems like N-Queens, graph coloring, and TSP.
5. Distinguish between deterministic and non-deterministic algorithms and understand their role in algorithmic problem solving.

Course Outcomes: After Completion of the Course, Students should be able to

- Analyze algorithm performance using recurrence relations, asymptotic notations, space complexity, time complexity, and disjoint set operations.
- Apply divide and conquer strategy for solving problems including binary search, quick sort, merge sort, and Strassen's matrix multiplication.
- Implement greedy and dynamic programming techniques for optimization problems including knapsack, job sequencing, spanning trees, shortest paths, and optimal binary search trees.
- Design solutions using dynamic programming and backtracking methods for complex problems including traveling salesperson, n-queen, sum of subsets, and graph coloring.
- Evaluate branch and bound techniques and classify computational problems under NP-Hard and NP-Complete categories using theoretical foundations.

UNIT-I

Introduction: Algorithm, Recurrence Relations, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and little oh notation. Disjoint Sets: Introduction, union and find Operations.

UNIT-II

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication

UNIT-III

Greedy method: General method, applications- knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem. Dynamic Programming: General method, applications- All pairs shortest path problem, Optimal binary search trees

UNIT-IV

Dynamic Programming: 0/1 knapsack problem, Reliability design, Traveling sales person problem. Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph coloring, Hamiltonian cycles

UNIT-V

Branch and Bound: General method, applications - 0/1 knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem, NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP- Complete classes, Cook's theorem

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Raja sekharan, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

ELECTRONIC RESOURCES:

1. <https://www.geeksforgeeks.org/design-and-analysis-of-algorithms/>
2. <https://www.programiz.com/dsa>
3. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
4. <https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I

8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos