MODERN ALGORITHM DESIGN FOUNDATION

Course Code	CE440		**Credits**	3	
Scheme of Instruction	L	T	P	TOTAL	
Hours/ Week	3	0	0	40 hrs/sem	
Scheme of Examination	IA	TW	TM	P	O
TOTAL = 125 marks	25	0	100	0	0

Course Outcomes:

The student will be able to:

CO1	Demonstrate how the different algorithm design approaches are used to solve various classes of engineering problems.
CO2	Compute and analyze the time and space complexities of algorithms and understand their rate of growth.
CO3	Implement the algorithms with help of different data structures.
CO4	Describe the different algorithm classes P, NP, and NP-Complete, Randomized, Probabilistic, Approximation.

UNIT -1	
Introduction: Algorithm Specification, Performance Analysis, and Analyzing of algorithms: Insertion sort, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem. Divide and Conquer: General method, Binary search, Finding the min and max, Merge sort, Quick sort: Sorting by partitioning, Selection: Finding the kth smallest element, Stassen's Matrix Multiplication.	10 hrs
UNIT -2	
Greedy Method: General Method, Knapsack Problem, Minimum cost Spanning tree, Single soured shortest path. Dynamic Programming: General Method, Multistage Graphs, All pair shortest paths, Single source shortest path with general weights, Optimal Binary Search Tree, 0/1 knapsack problem, Travelling salesperson problem.	10 hrs
UNIT -3	
Backtracking: General Method, n-queens problem, Sum of subsets problem, graph colouring, Hamiltonian Cycles, 0/1 knapsack problem. Branch-and-Bound: General Method, 0/1 knapsack, Travelling salesperson problem.	10 hrs
UNIT -4	
Internet Algorithms: String and pattern matching, Tries, Text compression, Text similarity testing.NP-hard and NP-complete problems: Basic concepts, Cooks theorem, Introduction: Randomized Algorithms, Probabilistic	10 hrs

algorithms, Approximation algorithms.	

TEXTBOOKS	
1	Fundamentals of Computer Algorithms – E. Horowitz et al, 2nd Edition UP.
2	Introduction to Algorithms, 3th Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
REFERENCES	
1	Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
2	Fundamentals of Algorithmics, Gilles Brassard, Paul Bratley, PHI
3	Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
4	Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley,Reading, MA.

MODERN ALGORITHM DESIGN FOUNDATION LAB

Course Code	CE460		**Credits**	**2**	
Scheme of Instruction **Hours/ Week**	**L**	**T**	**P**	**TOTAL**	
	0	**0**	**4**	**28 hrs/sem**	
Scheme of Examination **TOTAL = 75 marks**	**IA**	**TW**	**TM**	**P**	**O**
	0	25	**0**	**50**	**0**

At least 8 experiments out of below mentioned set are to be implemented.

1. Write a program to implement binary search using divide and conquer.
2. Write a program to implement Merge Sort using divide and conquer.
3. Write a program to implement Quick Sort using divide and conquer.
4. Write a program to implement minimum cost spanning trees using greedy approach.
5. Write a program to implement single source shortest path algorithm using greedy approach.
6. Write a program to implement 0/1 knapsack problem using dynamic programming.
7. Write a program to implement OBST using dynamic programming.
8. Write a program to implement single source shortest path algorithm using dynamic programming.
9. Write a program to implement sum of subset problem using backtracking.
10. Write a program to implement graph colouring problem using backtracking.
11. Write a program to implement pattern matching algorithms
12. Write a program to implement text compression and text similarity testing.