Design and Analysis of Algorithm	L	P	C
	4		4

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	5	PC	PC	CIC-311

Marking Scheme:
1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1.	To Introduce various designing techniques and methods for algorithms
2.	Performance analysis of Algorithms using asymptotic and empirical approaches
3.	Demonstrate a familiarity with major algorithms and data structures.
4.	To give clear idea on algorithmic design paradigms like Divide-and-Conquer, Dynamic Programming, Greedy, Branch & Bound, Back tracking and string matching and network flow. .

Course Outcomes (CO)

CO 1	Analyse asymptotic runtime complexity of algorithms including formulating recurrence relations and divide and conquer designing method.
CO 2	Describe the greedy paradigm and apply Greedy strategy for solving various problems.
CO 3	Apply dynamic programming and Branch & Bound approach to solve suitable problems
CO 4	Understand the concept of NP problems and string matching algorithm and various flow & sorting networks

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	1	1	1	1	1	2	2	2	2	1	1	1
CO 2	2	2	3	1	2	3	1	2	3	1	2	2
CO 3	2	2	1	1	2	3	3	2	1	3	1	2
CO 4	3	2	2	3	2	1	3	2	1	1	2	3

UNIT-I

Asymptotic notations for time and space complexity, Methods for solving Recurrence relations, Brief Review of Graphs, Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

Divide and Conquer: General method, binary search, merge sort, Quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT-II

Greedy Method: General method, knapsack problem, Huffman Codes, job sequencing with deadlines, minimum spanning trees, single souce paths and analysis of these problems.

Back Tracking: General method, 8 queen's problem, graph colouring, Hamiltonian cycles, and analysis of these

problems.

UNIT-III

Dynamic Programming: Ingredients of Dynamic Programming. Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems, 0-1 knapsack problem, Traveling salesperson problem, Floyd Warshall algorithm.
Branch and Bound: Method, O/I knapsack and traveling salesperson problem

UNIT - IV

String Matching: The naïve String Matching algorithm, The Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm.
Computational Complexity: Basic Concepts, Polynomial vs Non-Polynomial Complexity, NP- hard & NP-complete classes. Approximation Algorithms
Flow and Sorting Network:, Ford- Fulkerson method, Maximum bipartite matching, Sorting Networks, Comparison network, Zero- one principle, Bitonic sorting network, merging network

Textbook(s):

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Ed., PHI, 2013.
2. Udit Aggarwal, Algorithm Design and Analysis, Dhanpat Rai and Co.

References:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms/C++, Second Edition, Universities Press.
2. Jon Klenberg, Eva Tardos, Algorithm Design, Pearson Publications,2014.
3. A. V. Aho, J. E. Hopcroft, J. D. Ullman, The Design and Analysis of Computer Algorithms, Pearson, 2013.
4. Richard Neapolitan, Foundations of Algorithms, Fifth Edition, Jones & Bartlett Learning
5. Sara Base, Introduction to Design & analysis,Pearson