



GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Integrated MSc, 6th Semester
Branch: Information Technology
Subject Name: Design and Analysis of Algorithm
Subject Code: 1360501

Teaching and Examination Scheme

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Content:

Sr. No.	Content	Teaching Hours	Module Weightage (%)
1.	Basics of Algorithms and Mathematics: What is an algorithm? Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.	3	5
2.	Analysis of Algorithm: The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort	10	20
3.	Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Exponential.	7	20
4.	Dynamic Programming: Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.	7	20
5.	Greedy Algorithm: General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.	7	20
6.	Exploring Graphs: An introduction using graphs and games, Undirected Graph, Directed Graph, Traversing Graphs, Depth First Search, Breath First Search	3	10



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7.	Backtracking and Branch and Bound: Introduction, The Eight queens problem, Minimax principle	3	5
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Suggested Specification table with Marks (Theory):70

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	30	10	10	5	5

R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
4. Foundations of Algorithms, Shailesh R Sathe, Penram

Course Outcome:

After learning the course, the students should be able to:

No.	CO statement
CO-1	Analyze the asymptotic performance of algorithms.
CO-2	Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO-3	Find optimal solution by applying various methods.
CO-4	Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.
CO-5	Apply greedy and dynamic approach to different problems and analyze.