3IT01: DESIGN AND ANALYSIS OF ALGORITHM
CREDITS – 4 (LTP: 3,0,2)

Course Objective:

To understand, design and analyze efficient algorithm for various applications.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory		Practical		
L	T	P	C	ESE	CE	ESE	CE	
3	0	2	4	60	40	20	30	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Basics of Algorithm:** Introduction of algorithm, Designing of algorithm, Mathematical notation, Sets, Functions and relations, Vectors and matrices, Linear inequalities and linear equations.	4
2	**Analysis of Algorithm:** The efficient algorithm, Average, Best and worst case analysis, Asymptotic notations, Sorting algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort.	5
3	**Divide and Conquer Algorithm:** Introduction, Recurrence: substitution method and master theorem, Problem solving using divide and conquer algorithm - Multiplying large integers problem, Binary search, Sorting: Merge Sort, Quick Sort, Matrix multiplication, Exponential.	8
4	**Greedy Algorithm:** Characteristics of greedy algorithms, Problem solving using greedy algorithm:Making change problem, Activity selection problem, Minimum spanning trees: Kruskal's algorithm, Prim's algorithm, Shortest paths, The knapsack problem, Job scheduling problem, Huffman code.	9
5	**Dynamic Programming:** Introduction, The principle of optimality, Problem solving using dynamic programming: Calculating the binomial coefficient, Making change problem, Assembly line-scheduling, Knapsack problem, All points shortest path, Matrix chain multiplication, Longest common subsequence.	9
6	**Exploring Graphs:** Graphs and games: An introduction, Traversing graphs- Depth first search, Breadth first search, Topological sort, Connected components, Preconditioning, Backtracking and branch and bound: The eight queen's problem, Knapsack problem.	6
7	**String Matching:** Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String matching with finite automata.	3

Unit No.	Topics	Teaching Hours
8	**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP- completeness problem, NP-Hard problems, Travelling salesman problem, Hamiltonian problem.	2
	Total	**45**

List of References:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms",* Third Edition ,PHI Publication.
2. Gills Brassard, Paul Bratley, *"Fundamental of Algorithms",* Second Edition,PHI Publication
3. Dave and Dave, *"Design and Analysis of Algorithms"*, Second Edition ,Pearson Publication.
4. Anany Levitin, *"Introduction to Design and Analysis of Algorithms",* Third Edition ,Pearson Publication.

Course Outcomes (COs):

At the end of this course students will be able to …

1. Evaluate the asymptotic performance of algorithms.
2. Derive and solve recurrences performance using divide-and-conquer algorithms.
3. Find optimal solution by applying various design methods.
4. Understand, solve and analyze various graph applications.
5. Apply pattern matching algorithms to find exact pattern.
6. Differentiate polynomial and non-polynomial problems.