Faculty of Engineering and Technology

Bachelor of Technology

Effective from Academic Year: 2018-19

Branch Name:	Computer Engineering / Information Technology
Semester/Year:	Semester V / Third Year
Subject Title:	Design and Analysis of Algorithm
Subject Code:	1ET1030502
Pre-requisite:	Fundamentals of Data and file Structures

Course Objective: Obtaining efficient algorithms is very important in modern computer engineering as the world wants applications to be time and space efficient. This course enables to understand and analyze efficient algorithms for various applications.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
				Theory (Marks)		Practical (Marks)		
Lecture (L)	Tutorial (T)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
03	-	02	04	70	30	30	20	150

Subject Contents			
Sr. No	**Topic**	**Total Hours**	**Weightage (%)**
1	**Analysis of Algorithm:** Characteristic of algorithm, The efficient algorithm, Average, Best and worst case analysis, Asymptotic Notations, Analyzing control statement, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort, Heap sort, Sorting in linear time : Bucket sort, Radix sort	7	15
2	**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, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.	8	20
3	**Greedy Algorithm :**General Characteristics of greedy algorithms, Problem solving using 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	8	20
4	**Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming, Making Change Problem, Assembly Line Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.	7	15
5	**Backtracking and Branch and Bound:** Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Min-max principle	4	10
6	**String Matching:** Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata	3	10
7	**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP-Completeness Problem, NP-Hard Problems	3	10

Course Outcome:

1. Analyze the asymptotic performance of algorithms.
2. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Differentiate polynomial and non polynomial problems.

List of Text Books:

1. Introduction to Algorithms. Thomas Cormen, Charles Leiserson, Ronald Rivest. PHI publication
2. Fundamentals of Algorithms. Gilles Brassard, Paul Bratley. PHI publication.

List of Reference Books:

1. Design Analysis and Algorithms by Hari Mohan Pandey
2. Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
3. Design and Analysis of Algorithms, Dave and Dave, Pearson.
4. Fundamentals of Algorithms.-E. Horowitz et al.

List of Suggested titles of Experiments (If Any):

1. Implementation and Time analysis of sorting algorithms.
   Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort
2. Implementation and Time analysis of linear and binary search algorithm.
3. Implementation and Time analysis of factorial program using iterative and recursive method
4. Implementation of a knapsack problem using dynamic programming
5. Implementation of chain matrix multiplication using dynamic programming.
6. Implementation of making change problem using dynamic programming
7. Implementation of a knapsack problem using greedy algorithm
8. Implement prim's algorithm
9. Implement kruskal's algorithm.
10. Implement LCS problem