14CST43 DESIGN AND ANALYSIS OF ALGORITHMS

3 1 0 4

Pre-requisites: Data Structures and Problem Solving and Programming

UNIT – I 9

Introduction: Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms – Empirical analysis of algorithm – Algorithm visualization.

UNIT – II 9

Brute Force and Divide-and-Conquer: Brute Force – Selection and Bubble Sort, Sequential search and String matching- Depth First Search and Breadth First Search. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Binary tree traversals and related properties-Multiplication of large integers and Strassen's Matrix Multiplication.

UNIT – III 9

Decrease and conquer: Insertion sort – Topological Sorting-Computing a Median and the Selection Problem. **Transform and conquer:** Presorting – Balanced search trees – AVL trees -2-3Trees- Heaps and Heap sort

UNIT – IV 9

Dynamic Programming: Knapsack Problem and Memory functions – Optimal Binary Search Trees – Warshall's and Floyd' algorithm. **Greedy Technique:** Prim's algorithm – Kruskal's Algorithm- Dijkstra's Algorithm – Huffman Trees.

UNIT – V 9

Backtracking: n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem. **Branch and Bound:** Assignment problem – Knapsack Problem – Traveling Salesman Problem. Overview of P, NP and NP-Complete Problems

Lectures:45, Tutorial: 15, TOTAL: 60

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.

REFERENCE BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", 3rd Edition, Volumes I & III, Addison Wesley, 2011.
4. Steven S. Skiena, "The Algorithm Design Manual", 2nd Edition, Springer, 2008.
5. http://nptel.ac.in/course.php

COURSE OUTCOMES

On completion of the course the students will be able to

CO1: explain the different frameworks for algorithm design
CO2: apply brute force and divide and conquer techniques for various problems
CO3: utilize decrease and conquer and transform and conquer strategies for problem solving
CO4: interpret the role of dynamic programming and greedy techniques
CO5: outline P and NP problems with the help of backtracking and branch and bound techniques

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1									1	1	
CO2	3	3	3			1						2	3	3
CO3	3	3	3			1						2	3	3
CO4	3	3	3			1						3	3	3
CO5	3	3	3			1						3	1	1

1 – Slight, 2 – Moderate, 3 – Substantial