MCA 301   Design and Analysis of Algorithms

Module 1 (10 Hours)

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.Amortized Analysis.

Module 2(10 Hours)

BRUTE FORCE AND DIVIDE-AND-CONQUER

Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort –Heap Sort- Quick sort – Binary search – Multiplication of LargeIntegers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

Module 3(10 Hours)

DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

Module 4 (10 Hours)

ITERATIVE IMPROVEMENT

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- the Stable marriage Problem.

COPING WITH THE LIMITATIONS OF ALGORITHM POWER

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation

Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:
1.   Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2.   Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCES:

1.   Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2.   Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008
3.   http://nptel.ac.in/