MASTER OF COMPUTER APPLICATION

CODE: MCA-20-102

SUBJECT NAME: ANALYSIS & DESIGN OF ALGORITHMS

MCA   SEMESTER II

NO OF CREDITS: 4   SESSIONAL: 25

L   P   T   THEORY EXAM: 75

4   0   0   TOTAL: 100

Pre- Requisite: Data structures

Successive: None

Course Objectives:

1. To study mathematical preliminaries required to analyze and design computer algorithms and understand advanced data structures required to design efficient computer algorithms.
2. To make understand students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc.
3. Use various techniques for efficient algorithm design (divide-and-conquer, greedy, dynamic programming, backtracking and branch and bound algorithms) and are able to apply them while designing algorithms.
4. To study the concept of NP-complete problems and different techniques to deal with them. Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

Course Outcomes:

Upon successful completion of the course, the students will be able to

a. Analyze and compare complexity for different types of algorithms for different types of problems and apply mathematical preliminaries to the analyses and design stages of different types of algorithms.
b. Apply different types of data structures, analyze the best one for different types of problems and recognize the general principles and good algorithm design techniques for developing efficient computer algorithms.

c. Analyze on the suitability of a specific algorithm design technique for a given problem.
d. Implement efficient algorithms for new situations, using as building blocks the techniques learned and apply algorithm design techniques to solve certain NP-complete problems.

Syllabus:

Unit-I **INTRODUCTION:** Brief Review of stacks, queues, graphs, binary search tree, set and disjoints set union, general sorting algorithms, Analysis of algorithms in terms of space and time complexity.

Unit-II **DIVIDE AND CONQUER SEARCH, SORT AND GREEDY METHODS:**General method, binary search, ternary search algorithm, merge sort, quick sort, selection, strassen's matrix multiplication, analysis of algorithms for these problems. Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths, optimal storage on tapes, optimal merge patterns and analysis of these problems.

Unit-III **DYNAMIC PROGRAMMING AND BACK TRACKING**: General method, single source shortest path, all pair shortest path, optimal binary search trees, 0/1 knapsack, the traveling salesman problem. General method of backtracking, 8 queen's problem, graph coloring, sum of subsets, Hamiltonian cycles, analysis of these problems.

Unit-IV **BRANCH AND BOUND**: General Method, 0/1 knapsack and traveling salesman problem. NP-Hard And NP-Complete PROBLEMS**:** P, NP, NP-Hard, NP-Complete, Cook's Theorem and Problem Solving.

Text / Reference Books:

1. Fundamental of Computer algorithms, Ellis Horowitz and SartajSahni, 1978, Galgotia Publ.,
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson and Ronald L Rivest: 1990, TMH.
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986.
5. Johan Wiley & Sons,
6. Writing Efficient Programs, Bentley, J.L., PHI
7. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.