MCA – 102 Data Structures and Algorithm Analysis

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Course Objectives:

The objective of this course is to provide basic to advance level of knowledge to student regarding various types of data structures and to provide knowledge regarding various problem solving techniques like greedy, divide and conquer, dynamic and backtracking.

UNIT-I

Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation, quick sort technique to sort an array, recursion),Queues, Priority Queues, Linked Lists(traversal, insertion, deletion),type(linear, circular, doubly linked, inverted), Trees, Binary Tree, Binary Search Tree, AVL Tree, Hashing.

UNIT –II

Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations.

Divide and Conquer: The General Method, Merge Sort, Quick Sort, Selection sort.

The Greedy Method: The General Method Knapsack Problem, Job Sequencing With Deadlines, Huffman Coding.

UNIT-III

Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Minimum Spanning Trees(Kruskal's Algorithm, Prim's Algorithm).

Dynamic Programming: The General Method Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Traveling Salesperson Problem.

UNIT – IV

Back Tracking: The General Method, The 8 Queens Problem, Sum Of Subsets, Graph Coloring, And Hamiltonian Cycles.

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility.

Text Book:

1. Seymour Lipschutz, "Data Structures", McGraw Hill Education.

Reference Books:

1. *Parag* H. *Dave*, *Himanshu* B. *Dave,* Design and Analysis of Algorithms, *Pearson* Education (2007).
2. Jean Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill Publications.
3. Robert L. Kruse,"Data Structures & Program Design", PHI Publications.
4. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, Prentice-Hall of India, 2006.

5. J. Kleinberg and E.Tardos, Algorithms Design, Pearson Education, 2006.

Course Outcomes:

By the end of the course, students will be able to
CO 1. Implement different types of data structures.
CO 2. Differentiate between various types of problem solving techniques.
CO 3. Calculate the complexity of a problem.
CO 4. Differentiate between N and NP problems.
CO 5. Solve problems related to graph theory.

Note: In each theory paper, nine questions are to be set. Two questions are to be set from each Unit and candidate is required to attempt one question from each unit. Question number nine will be compulsory, which will be of short answer type with 5-10 parts, out of the entire syllabus. In all, five questions are to be attempted.