CS 210 DATA STRUCTURES & ALGORITHMS (3-0-2 : 4)

Introduction & Overview: Concept of data type, definition and brief description of various data structures, operations on data structures, algorithm complexity, Big Oh notation.

Review of Pointers and Dynamic Memory Management: Understanding pointers, usage of pointers, memory management functions, debugging pointers.

Arrays: Linear and multi-dimensional arrays and their representation, operations on arrays, sparse matrices and their storage.

Linked Lists: Linear linked list, operations on linear linked list, doubly linked list, operations on doubly linked list, application of linked lists.

Stacks: Sequential and linked representations, operations on stacks, multi stacks, application of stacks such as parenthesis checker, evaluation of postfix expressions, conversion from infix to postfix representation, implementing recursive functions.

Queues: Sequential representation of queue, linear queue, circular queue, operations on linear and circular queue, linked representation of a queue and operations on it, priority queues, applications of queues.

Trees: Basic terminology, array and linked representations of trees, traversing a binary tree using recursive and non-recursive procedures, inserting a new node, deleting a node, counting nodes, finding height, AVL trees.

Graphs: Basic terminology, representation of graphs (adjacency matrix, adjacency list), traversal of a graph (breadth first search and depth-first search), adding nodes, deleting nodes, applications of graphs in problems such as finding shortest paths, obtaining minimum cost spanning tree etc.

Sorting & Searching: Sorting arrays using bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, shell sort, radix sort, etc.; Searching an element using linear search and binary search techniques.

Hashing: Comparing direct address tables with hash tables, hash functions, concept of collision and its resolution using open addressing and separate chaining.

Basic Algorithmic Techniques: Divide & conquer, dynamic programming, greedy method, backtracking, branch and bound, randomization.

Text Books:
1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman: "Data Structures & Algorithms", Pearson, 1/E, Reprint, 2002.
2. Yedidyah Langsam, Aaron M. Tenenbaum, Moshe J. Augenstein: "Data Structures using C and C++", PHI Learning, 2nd ed, 2009.