Data Structures and Algorithms (DSA-131M)

(Credits: 3 Theory + 1 Lab)

UNIT I:
Algorithms and computer programming for problem solving
Basic C: Data types, control structures, pointers, arrays, structures, self referential structures.

UNIT II:
Data structures: Linear list, array implementation of lists, linked lists, applications
Stacks: Array and linked list implementation of stacks, recursive programming
Queues: Array and linked list implementation of queues, job scheduling

UNIT III:
Sorting: Bubble sort, selection sort, insertion sort, merge sort, quick sort, heap sort
Searching: Linear (sequential) and binary search

UNIT IV:
Graphs and Trees: Basic terminology, trivial graph, directed and undirected graph, path, loop (closed path), implementation of graph using linked list
Graph traversal: DFS and BFS
Trees: Trivial tree, binary tree, m-way tree, conversion of graph into tree, DFS and BFS based spanning trees, Kruskal's algorithm, Prim's algorithm
Applications of graphs: Shortest path algorithm, applications in Bioinformatics

UNIT V:
Search trees: Binary and m-way search trees (introduction), binary search and binary tree search, linked list implementation of binary trees, height balance trees (AVL) for searching (introduction), B tree (introduction)
Applications of trees and search trees

UNIT VI:
Heaps: Heap as binary tree, generation of heaps, heap sorting
Hashes: Hashing by chaining

Text/Reference Books:

1. Introduction to Algorithms, *Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein*
2. Data Structures Using C and C++, *Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum*
3. The C Programming Language (2nd Edition), *Brian W. Kernighan and Dennis Ritchie*