**Design and Analysis of Algorithms – I**

**CSE 2202**



| **Lectures** | **Topics** |
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| **1-4** | Graph Traversal:   * Review of Breadth first search (BFS), Depth first search (DFS), * Topological Sort * Strongly Connected Components, Euler Path * Articulation Point, Bridge, Bi-connected Components. |
| **5-7** | Shortest Path Algorithms:   * Dijkstra’s Shortest Path Algorithm * Bellman-Ford algorithm and negative cycle detection * Shortest path in Directed Acyclic Graph. * Floyd-Warshall all pair shortest path algorithm, Johnson’s Algorithm |
| **8-10** | Greedy Algorithms:   * Elements and properties of Greedy algorithms * fractional knapsack, job scheduling with deadline * Minimum spanning tree: Prim’s algorithm and Kruskal’s algorithm. |
| **11-13** | Complexity analysis and Recurrence Relation  Asymptotic notations, growth of a function, methods to solve recurrence relation:   * Substitution method * Recursion tree method * Master method |
| **14-18** | Dynamic Programming:   * Basic idea, properties and comparison with Divide & Conquer and Greedy Algorithms * Rod Cutting algorithm * General form of Dynamic Programming and Memorization * coin-related problems, Longest Increasing subsequence (LIS), Longest Common Subsequence (LCS) * 0/1 Knapsack, Matrix Chain Multiplication * Rock Climbing   Applications of Dynamic Programming. |
| **19-21** | Divide & Conquer (DC):   * Counting Inversion using merge sort * Closest pair of points, * finding Ak mod M using DC method * Finding median (in general k-th smallest element) in a set using DC in   expected linear time. |
| **22-24** | Network Flow  • Flow Networks  • Max-Flow Min-cut theorem  • Ford Fulkerson method and its limitation  • Edmonds Karp algorithm  • Maximum bipartite matching  • Minimum path cover, edge cover. |