

Design and Analysis of Algorithms

IT, 3rd Semester, 2022

Syllabus (Theory)

Module	Topics
1	Introduction: Role of Algorithm in computing Complexity analysis: Growth of Functions (Asymptotic notations, standard notations and common functions); Best Case, Worst Case, Average Case; Recurrences, solution of recurrences: substitution, recursion tree, Master method Divide and Conquer algorithms: Merge sort, Quick sort; Heapsort: Heaps, building a heap, the heapsort algorithm; Priority Queue, Binary search, Lower bounds for sorting.
2	Dynamic Programming: Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Activity selection Problem Greedy Algorithms: Elements of Greedy strategy, Fractional knapsack problem, Huffman codes Zero-one knapsack (after completing fractional knapsack) Data Structures for disjoint sets: Disjoint set operations, Linked list representation, Disjoint set forests.
3	Graph algorithms (revision): Graph and their Representations, Breadth-first and depth-first search, Minimum Spanning Trees, Kruskal's and Prim's algorithms, single-source shortest paths (Bellman-ford and Dijkstra's algorithms), All-pairs shortest paths (Floyd – Warshall Algorithm), Back tracking, Branch and Bound. Fast Fourier Transform String matching: Rabin-Karp algorithm P-vs-NP: Completeness (Polynomial time, Polynomial time verification, NP-Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms (Vertex-Cover Problem, Traveling Salesman Problem).

Textbook:

Introduction to Algorithms, third edition, The MIT Press, (2009). Cormen, T H, C E Leiserson, R L Rivest, and C Stein. (CLRI)

Evaluation

1. Quizzes – 15 marks
2. Mid-term – 30 marks
3. End-term – 50 marks
4. Internal assessment – 5 marks

Lab topics

Lab Number	Topic
1	Introduction and basics of complexity analysis; recap of data structures
2	Recursion and related algorithms
3	Divide and conquer approach
4	Divide and conquer approach (contd.)
5	Dynamic Programming
6	Greedy Approach
7	Disjoint set data structures
8	Graph algorithms
9	Graph algorithms (contd.)
10	Backtracking

Lab evaluation

1. Weekly lab marking – 5x10=50 marks
2. Lab test – 30 marks
3. Viva/quiz – 20 marks

Tentative timetable

Day\Slot	9am – 10am	10am – 11am	11am – 12pm	12pm – 1pm	1pm – 2pm	2pm – 3pm	3pm – 4pm	4pm – 5pm
Monday	N O N E	GROUP-2: LAB-2			B R E A K			
Tuesday				CG-07				
Wednesday		CG-07						
Thursday		GROUP-1: LAB-2					CG-07	
Friday		CG-07						