Indraprastha College for Women
University of Delhi

Work Plan for ODD SEMESTER – 2025

Course Name:	B.A. (Prog.)
Paper Title:	Design and Analysis of Algorithms
Unique Paper Code:	
Semester:	VII
Faculty(s):	Mr. Harendra Pratap Singh
Year:	2025-2026

Work Plan			
Unit No.	Learning Objective	Lecture No.	Topics to be Covered
I	**Searching, Sorting, Selection**	1	Linear search
		2	Binary Search
		3	Insertion Sort
		4	Selection Sort
		5	Bubble sort
		6	Heap Sort
		7	Linear Time Sorting
		8	Selection Problem
		9	Running time analysis and correctness
		10	Running time analysis and correctness
II	**Graphs**	11	Review of graph traversals
		12	Graph connectivity
		13	Testing bipartiteness
		14	Directed Acyclic Graphs
		15	Topological Ordering

III	**Divide and conquer**	16	Introduction to divide and conquer techniques
		17	Introduction to divide and conquer techniques
		18	Merge Sort
		19	Merge Sort
		20	Quick Sort
		21	Quick Sort
		22	Maximum-subarray problem
		23	Maximum-subarray problem
		24	Strassen's Algorithm for matrix multiplication
		25	Strassen's Algorithm for matrix multiplication
IV	**Greedy Algorithms**	26	Introduction to Greedy Algorithm design approach
		27	Application to minimum spanning trees
		28	Fractional knapsack problem etc
		29	Fractional knapsack problem with correctness
		30	Fractional knapsack problem and analysis of time complexity
V	**Dynamic Programming**	31	Introduction to Dynamic Programming approach
		32	Application to subset sum
		33	Integer knapsack problem etc
		34	Integer knapsack problem with correctness
		35	Integer knapsack problem and analysis of time complexity
VI	**Intractability**	36	Concept of polynomial time computation
		37	Polynomial time reductions
		38	Decision vs optimization problems
		39	Introduction to NP, NP-Hard class
		40	NP-Complete class
VII	**Advanced Analysis of Algorithms**	41	Amortized Analysis
		42	Amortized Analysis
		43	Amortized Analysis
		44	Amortized Analysis
		45	Amortized Analysis

Unit	Contents/Syllabus
I	**Searching, Sorting, Selection:** Linear search, Binary Search, Insertion Sort, Selection Sort, Bubble sort, Heap Sort, Linear Time Sorting, Selection Problem, Running time analysis and correctness
II	**Graphs:** Review of graph traversals, Graph connectivity, Testing bipartiteness, Directed Acyclic Graphs, Topological Ordering
III	**Divide and conquer:** Introduction to divide and conquer techniques, Merge Sort, Quick Sort, Maximum-subarray problem, Strassen's Algorithm for matrix multiplication
IV	**Greedy Algorithms:** Introduction to Greedy Algorithm design approach, Application to minimum spanning trees, Fractional knapsack problem etc with correctness and analysis of time complexity
V	**Dynamic Programming:** Introduction to Dynamic Programming approach, Application to subset sum, Integer knapsack problem etc, correctness and analysis of time complexity
VI	**Intractability:** Concept of polynomial time computation, Polynomial time reductions, Decision vs optimization problems, Introduction to NP, NP-Hard and NP-Complete class
VII	**Advanced Analysis of Algorithms:** Amortized Analysis

S. No.	Name of Authors/Books/Publishers
1.	Corman, T.H., Leiserson, C.E., Rivest, R.L., Stein C. *Introduction to Algorithms*, 4th edition, Prentice Hall of India, 2022
2.	Kleinberg, J., Tardos E. *Algorithm Design*, 1st edition, Pearson, 2013

	Paper Components		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**
4	**3**	**NA**	**1**
Assessment Scheme			
S.No.	**Component**	**Marking Scheme**	**Total Marks**
1	Internal Assessment • Assignment/Quiz/Project/ Presentation • Class Test • Attendance	12 12 6	**30**

2.	Continuous Assessment (**Tutorial)** • Activity 1 • Activity 2 • Attendance	 NA NA NA	NA
3.	Practical • Continuous Assessment • End Term Written/Practical Exam • Viva	 10 20 10	**40**
4.	End Semester Examination		**90**