Indraprastha College for Women
University of Delhi

Work Plan for ODD SEMESTER – 2025

Course Name:	B.Sc. (Hons.) Computer Science
Paper Title:	Design and Analysis of Algorithms
Unique Paper Code:	As per University Datesheet
Semester:	VII
Faculty(s):	Mr. Shailender Singh
Year:	JULY 2025

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	Heapsort,
		7	Linear Time Sorting,
		8	Selection Problem,
		9-10	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 technique,
		17-18	Merge Sort,

		19-20	Quick Sort,
		21-22	Maximum-subarray problem,
		23-25	Strassen's algorithm for matrix multiplication.
IV	Greedy algorithms	26	Introduction to the Greedy algorithm design approach,
		27-28	application to minimum spanning trees,
		29	fractional knapsack problem, with correctness,
		30	analysis of time complexity.
V	Dynamic Programming	31	Introduction to the Dynamic Programming approach,
		32-33	application to subset sum,
		34	integer knapsack problem etc.,
		35	correctness, and analysis of time complexity.
VI	Intractability	36	Concept of polynomial time computation,
		37	polynomial time reductions,
		38	decision vs optimization problems,
		39-40	Introduction to NP, NP-hard and NP-Complete classes.
VII	Advanced Analysis of Algorithms:	41-45	Amortized Analysis.

Unit	**Contents/Syllabus**
I	Searching, Sorting, Selection: Linear Search, Binary Search, Insertion Sort, Selection Sort, Bubble Sort, Heapsort, Linear Time Sorting, Selection Problem, running time analysis and correctness.
II	Graphs: Review of graph traversals, graph connectivity, testing bipartiteness, Directed Acyclic Graphs and Topological Ordering.
III	Divide and Conquer: Introduction to divide and conquer technique, Merge Sort, Quick Sort, Maximum-subarray problem, Strassen's algorithm for matrix multiplication.
IV	Greedy algorithms: Introduction to the 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 the 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 classes.
VII	Advanced Analysis of Algorithms: Amortized Analysis.

S. No.	**Name of Authors/Books/Publishers**
1.	Cormen, 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.
3.	Basse, S., Gelder, A. V., Computer Algorithms: Introduction to Design and Analysis, 3rd edition, Pearson, 1999.

	Paper Components		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**
4	**3**	**0**	**1**
Assessment Scheme			
S.No.	**Component**	**Marking Scheme**	**Total Marks**
1	Internal Assessment	Yes	30
	• Assignment/Quiz/Project/ Presentation	12	
	• Class Test	12	
	• Attendance	6	
2.	Continuous Assessment (**Tutorial)**	NA	NA
	• Activity 1	NA	
	• Activity 2	NA	
	• Attendance	NA	
3.	Practical	Yes	40
	• Continuous Assessment	10	
	• End Term Written/Practical Exam	20	
	• Viva	10	
4.	End Semester Examination		90