



ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (Hons.) Computer Science						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
VI	32341401	DSC- Design and Analysis of Algorithms	4	0	4	6
Teacher/Instructor(s)		Ms Archana Gahlaut				
Session		2021-22				

Course Objective:

- This course is designed to introduce the students to design and analyse algorithms in terms of efficiency and correctness.
- The course focuses on highlighting difference between various problem-solving techniques for efficient algorithm design.

Course Learning Outcomes:

On successful completion of this course, the student will be able to:

1. Given an algorithm, identify the problem it solves.
2. Write algorithms choosing the best one or a combination of two or more of the algorithms
design techniques: Iterative, divide-n-conquer, Greedy, Dynamic Programming using appropriate data structures.
3. Write proofs for correctness of algorithms.
4. Re-write a given algorithm replacing the (algorithm design) technique used with a more appropriate/efficient (algorithm design) technique.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	Algorithm Design Techniques (Sorting &	1-2	Iterative technique: Applications to Sorting, their correctness and analysis

	Searching)	3-4	Searching (review), their correctness and analysis
		5-6	Divide and Conquer: Application to Sorting and Searching (review of binary search),
		7-8	Merge sort, their correctness and analysis.
		9-10	Quick sort, its correctness and analysis
		11-12	Quick sort, its correctness and analysis
		13-14	Heapsort, its correctness and analysis
		15-16	Heapsort, its correctness and analysis
		17-18	Lower Bounds using decision trees
		19-20	Linear Time – Radix Sort and Count Sort, their analysis
		21-22	Linear Time Sorting: Bucket sort and its Analysis
		2.	Greedy Algorithms
25-26	Scheduling to Minimize lateness		
27-28	Minimum Spanning Tree: Prim’s Algorithm, Its Analysis and Proof of Correctness		
29-30	Minimum Spanning Tree: Kruskal’s Algorithm, Its Analysis and Proof of Correctness Class Assignment		
31-32	Medians & Order Statistics with analysis: Minmax method		
33-34	Medians & Order Statistics with analysis: Selection in expected Linear time		
35-36	Medians & Order Statistics with analysis: Minmax method		
3.	Graph Algorithms and Amortized Analysis	37-38	Amortized analysis: Aggregate Method of Analysis
		39-40	Amortized analysis: Accounting Method
		41-42	Amortized analysis: Potential Method
		43-44	Priority Queues
		45-46	Graph Representation: Adjacency List and adjacency matrix.
		47-48	Graph Representation: Depth First Search, Applications
		49-50	Topological Sort
		51-52	Class Test
		53-54	Breadth First Search, and its applications
4.	Dynamic Programming	55-56	DP: weighted interval scheduling problem
		57-58	DP: Subset Sum problem
		59-60	DP: knapsack Problem

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		

	<ul style="list-style-type: none"> • Class Test • Attendance • Assignment 		
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	Contents	Contact Hours
I	<p>Algorithm Design Techniques: Iterative technique: Applications to Sorting and Searching (review), their correctness and analysis. Divide and Conquer: Application to Sorting and Searching (review of binary search), merge sort, quick sort, their correctness and analysis.</p> <p>Dynamic Programming: Application to various problems (for reference; Weighted Interval Scheduling, Sequence Alignment, Knapsack), their correctness and analysis.</p>	20
II	<p>More on Sorting and Searching: Heapsort, Lower Bounds using decision trees, sorting in Linear Time - Bucket Sort, Radix Sort and Count Sort, Medians & Order Statistics, complexity analysis and their correctness</p>	10
III	<p>Advanced Analysis Technique: Amortized analysis</p> <p>Greedy Algorithms: Application to various problems, their correctness and analysis.</p>	18
IV	<p>Graphs: Graph Algorithms - Breadth First Search, Depth First Search and its Applications.</p>	12
	Total	60
Suggested Books:		
Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Kleinberg, J., & Tardos, E. <i>Algorithm Design</i> . 1st edition. Pearson Education India.	2013
2.	Cormen, T.H., Leiserson, C.E. Rivest, R.L., & Stein, C. <i>Introduction to Algorithms</i> . 3rd edition. PHI.	2015
3.	Sarabasse & Gleder A. V. (1999). <i>Computer Algorithm – Introduction to Design and Analysis</i> . 3rd edition. Pearson Education.	1999

Mode of Evaluation:	Internal Assessment / End Semester Exam
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