UE18CS251 - Design and Analysis of Algorithms (4:0:0:0:4)

# of Hours: 56

Class #	Chapter Title / Reference Literature	Topics to be Covered	% of Portion covered	
			% of Syllabus	Cumulative %
1	**Unit #1** **T1: Chapters 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4**	The motivation for the course. Scheme of the course. Introduction to Algorithms.	**16.07**	**16.07**
2		Fundamentals of Algorithmic problem-solving. Important problem types – sorting, searching.		
3		Important problem types – string processing, graph problems, Combinatorial, Geometrical, numerical problems		
4		Analysis Framework, Orders of Growth		
5		Asymptotic Notations		
6		Basic Efficiency Classes		
7		Analysis of Non-recursive Algorithms		
8		Analysis of Recursive Algorithms		
9		Solving Recurrences of Recursive Algorithms		
10	**Unit #2** **T1: Chapters 3.1, 3.2, 5.2, 3.4, 5.1, 5.3, 5.4, 5.5**	Brute-Force approach and Sequential Search	**23.22**	**39.29**
11		Brute-Force String Matching		
12		Selection Sort and Bubble Sort		
13		Exhaustive Search – Travelling Salesman Problem		
14		Knapsack Problem, Assignment Problem		
15		Recursion		
16		Decrease-and-Conquer approach - Insertion Sort		
17		Depth First Search		
18		Breadth First Search		
19		Topological Sorting		
20		Algorithms for Generating Combinatorial Objects		
21		Johnson Trotter Algorithm		
22		Decrease-by-a-Constant-Factor Algorithms		
23	**Unit #3** **T1: Chapters 4.1, 4.2, 4.3, 4.4, 4.5, 6.1, 6.3, 6.4, 7.4**	Divide-and-Conquer approach with Mergesort	**19.64**	**58.93**
24		Quicksort		
25		Binary Search		
26		Multiplication of Large Integers		
27		Strassen's Matrix Multiplication		
28		Transform-and-Conquer approach - Presorting		
29		Heapsort		
30		Balanced Search Trees - AVL and Red-black Trees		
31		Red-black Tree Construction		
32		2-3 Trees		
33		B Trees		

34	**Unit #4** **T1: chapters 7.1, 7.2, 12.1, 12.2, 9.1, 9.2, 9.3, 9.4**	Space and Time Tradeoffs - Sorting by Counting	**19.64**	**78.57**
35		Distribution Counting Sort		
36		Input Enhancement in String Matching – Horspool's algorithm		
37		Boyer-Moore Algorithm		
38		Backtracking: N queens Problem, Hamiltonian circuit Problem		
39		Branch-and-Bound: Knapsack Problem, Travelling Salesman Problem		
40		Greedy Approach		
41		Prim's Algorithm		
42		Kruskal's Algorithm		
43		Dijkstra's Algorithm		
44		Huffman trees		
45	**Unit #5** **T1: chapters 8.1, 8.4, 8.2, 11.1, 11.2, 11.3**	Dynamic Programming approach	**21.43**	**100**
46		Examples of Dynamic Programming		
47		Computing a Binomial Coefficient		
48		Knapsack problem and Memory Functions		
49		Problem: All-pairs Shortest-paths		
50		Floyd's Algorithm		
51		Problem: Finding Transitive Closure		
52		Warshall's Algorithm		
53		Lower Bound Algorithms		
54		Decision Trees		
55		P, NP and NP-Complete classes of problems		
56		Coping with the limitations of Algorithm Power		

Literature

Book Type	Code	Title & Author	Publication Information		
			Edition	Publisher	Year
Text Book	T1	*Introduction to The Design and Analysis of Algorithms* Anany Levitin	2	Pearson	2011
Reference Book	R1	*Introduction to Algorithms* Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein	3	Prentice-Hall India	2009
Reference Book	R2	Horowitz, Sahni, Rajasekaran, *Fundamentals of Computer Algorithms*	2	Universities Press	2007
Reference Book	R3	Jon Kleinberg, Eva Tardos, *Algorithm Design*	1	Pearson Education	2006