ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Computer Science and Engineering

Micro Lesson Plan

Subject: **DESIGN AND ANALYSIS OF ALGORITHMS**
Teacher : Dr RAJENDRA BABU CHIKKALA
Academic Year:2020-21
Year/Semester: III-SEM-II
Name of the Program: B.Tech

Section: CSE

Course Outcomes:

Factual	• To understand the design and analysis of algorithms.
Conceptual	• To understand key concepts sorting, searching, greedy method, dynamic methods • To be familiarity with information of time and space complexity with examples .
Procedural	• To master all greedy , dynamic, backtracking, branch and bounding methods • To master all algorithms of sorting, searching, tree traversal • To master greedy and dynamic methods
Applied	• To be familiar with asymptotic , amortization methods • To be familiar with back tracking and branch and bounding methods

Text book References:

Text book-1 : Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
Text book-2 : Introduction to AlgorithmsThomas H. Cormen, PHI Learning
Text book-3 : The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman.

Contents/Activities:

1	**Factual:**Factual knowledge consists of the basic elements students must know to be acquainted with a discipline	• Algorithms(Unit-I) • Recursive(Unit-I) • Space and Time Complexity(Unit-I) • Divide and Conquer(Unit-II) • Searching and Sorting(Unit-II) • Greedy Methods(Unit-III) • Knapsack Problem(Unit-III) • Dynamic Programming(UNIT-IV) • All pairs shortest path(Unit-IV) • Single source shortest Path(UNIT-IV) • Backtracking(UNIT-V) • Graph Coloring(UNIT-V) • 8-Queens(UNIT-V) • Hamiltonian Cycle(UNIT-V) • Branch and Bound(UNIT-VI) • LC Search(UNIT-VI) • FIFO BB(Unit-VI)
2	**Conceptual:**Conceptual knowledge consists of the interrelations among the basic elements within a larger structure	• Time Complexity (Unit-I) • Space Complexity (Unit-II) • Amortized Complexity (Unit-I) • Asymptotic Notation (Unit-I) • Binary Search (Unit-II) • Quick Sort (Unit-II) • Merge Sort (Unit-II) • Defective Chessboard (Unit-II) • Knapsack Problem (Unit-III) • Job Sequencing (Unit-III) • Minimum Cost Spanning Tree(Unit-III) • Single Source Shortest Path(Unit-III) • Multistage graph (Unit-IV) • OBST (Unit-IV) • String Edit (Unit-IV) • Sum of Subsets (Unit-V) • Hamiltonian Cycle (Unit-V) • LC Search (Unit-VI) • 15-puzzle problem(Unit-VI)
3	**Procedural:**methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.	• Time Complexity (Unit-I) • Space Complexity (Unit-II) • Amortized Complexity (Unit-I) • Asymptotic Notation (Unit-I) • Binary Search (Unit-II) • Quick Sort (Unit-II) • Merge Sort (Unit-II) • Defective Chessboard (Unit-II) • Knapsack Problem (Unit-III) • Job Sequencing (Unit-III) • Minimum Cost Spanning Tree(Unit-III) • Single Source Shortest Path(Unit-III) • Multistage graph (Unit-IV) • OBST (Unit-IV) • String Edit (Unit-IV) • Sum of Subsets (Unit-V)

		• Hamiltonian Cycle (Unit-V) • LC Search (Unit-VI) • 15-puzzle problem(Unit-VI)
4	**Applied:** awareness of one's own learning, control and regulation of cognitive processes, self-knowledge, contextual knowledge, and conditional learning	• Recursive Algorithms(Unit-I) • Divide and Conquer(Unit-II) • Greedy Method(Unit-III) • Dynamic Method(Unit-IV) • Backtracking(Unit-V) • Branch and Bound(Unit-VI)

Schedule and Sequence:

Day	Topic	Objectives	Before Class-Videos, e-Books, Case Studies	In-Class-Activities, Quiz	Post-Class-Assignment, Discussion Forum
			UNIT-I		
1	**Introduction:** What is an Algorithm,	To understand the Algorithm specification and pseudocode conventions	Refer Text book -1	Lecture on Algorithm Q & A Session	Discussion in Forum
2	Algorithm Specification, Pseudocode Conventions		Refer Text book -1	Lecture on Pseudocode Q & A Session	Discussion in Forum
3	Recursive Algorithm		Refer Text book -1 Refer the video https://www.youtube.com/watch?v=PVrbRrI0jG4&list=PL7DC83C6B3312DF1E&index=3	Lecture on Recursive algorithm Q & A Session	Discussion in Forum
4	Performance Analysis		Refer Text book -1 Refer the video https://www.youtube.com/watch?v=PVrbRrI0jG4	Lecture on performance analysis Q & A Session	Discussion in Forum
5	Space Complexity, Time Complexity		Refer Text book -1	Lecture on Space & Time complexity Q & A Session	Discussion in Forum
6	Amortized Complexity		Refer Text book -1	Lecture on Amortized complexity Q & A Session	Discussion in Forum
7	Asymptotic Notation		Refer Text book -1	Lecture on Asymptotic Q & A Session	Discussion in Forum
8	Asymptotic Notation		Refer Text book -1	Lecture on Asymptotic notation Q & A Session	Discussion in Forum
9	Practical Complexities		Refer Text book -1	Lecture on Practical complexities Q & A Session	Discussion in Forum
10	Practical Complexities, Performance Measurement.		Refer Text book -1	Lecture on Practical complexities Q & A Session	Discussion in Forum
			UNIT-II		
11	**Dived and Conquer:** General Method	To understand key concepts of Sorting and Searching	Refer Text book -1	Lecture on Basics Q & A Session	Discussion in Forum
12	Defective Chessboard		Refer Text book -1	Lecture on defective chess board Q & A Session	Discussion in Forum
13	Binary Search		Refer Text book -1	Lecture on binary search	Discussion in Forum

				Q & A Session	
14	Finding the Maximum and Minimum		Refer Text book -1	Lecture on min&max Q & A Session	Discussion in Forum
15	Merge Sort,		Refer Text book -1	Lecture on Merge sort Q & A Session	Discussion in Forum
16	Merge Sort,		Refer Text book -1	Lecture on Merge sort Q & A Session	Discussion in Forum
17	Quick Sort		Refer Text book -1 Refer the following videos ● https://www.youtube.com/watch?v=i2xhlKLJ5FI&list=PL7DC83C6B3312DF1E&index=6 ● https://www.youtube.com/watch?v=gtWw_8VvHjk ● https://www.youtube.com/watch?v=KrjWloKRE2U	Lecture on Quick sort Q & A Session	Discussion in Forum Short Quiz
18	Performance Measurement		Refer Text book -1	Lecture on performance measurement Q & A Session	Discussion in Forum
19	Randomized Sorting Algorithms.		Refer Text book -1	Lecture on Randomized sorting Q & A Session	Discussion in Forum
			UNIT III		
20	**The Greedy Method**: The General Method	To learn Greedy method concepts on knapsack, job sequencing, minimum cost spanning tree	Refer Text book -1 Refer the following videos ● https://www.youtube.com/watch?v=EcT-Jt5WStw&list=PL7DC83C6B3312DF1E&index=10 ● https://www.youtube.com/watch?v=L1PvJO_1f84&list=PL7DC83C6B3312DF1E&index=11 ● https://www.youtube.com/watch?v=srOghUgUZAQ&list=PL7DC83C6B3312DF1E&index=12	Lecture on greedy method Q & A Session	Discussion in Forum

21	Knapsack Problem		Refer Text book -1	Lecture on knapsack problem Q & A Session	Discussion in Forum
22	Job Sequencing with Deadlines		Refer Text book -1	Lecture on jobsequencing with deadlines Q & A Session	Discussion in Forum
23	Minimum-cost Spanning Trees		Refer Text book -1	Lecture on minicost spanning tree Q & A Session	Discussion in Forum
24	Prim's Algorithm		Refer Text book -1	Lecture on prims algo Q & A Session	Discussion in Forum
25	Kruskal's Algorithms		Refer Text book -1	Lecture on Kruskal's Algorithm Q & A Session	Discussion in Forum
26	An Optimal Randomized Algorithm		Refer Text book -1	Lecture on ORA Q & A Session	Discussion in Forum
27	Optimal Merge Patterns		Refer Text book -1	Lecture on Optimal Merge pattern Q & A Session	Discussion in Forum
28	Single Source Shortest Paths		Refer Text book -1	Lecture on single source shortestpath Q & A Session	Discussion in Forum
UNIT-IV					
29	**Dynamic Programming:** All - Pairs Shortest Paths	To understand the concepts on all pairs shortest path,0/1 knapsack, reliability design	Refer Text book -1	Lecture on AIPSP Q & A Session	Discussion in Forum
30	All - Pairs Shortest Paths		Refer Text book -1	Lecture on AIPSP Q & A Session	Discussion in Forum
31	Single – Source Shortest paths General Weights		Refer Text book -1 Refer the following videos 1. https://www.youtube.com/watch?v=_4CGMB5j_CQ 2. https://www.youtube.com/watch?v=b6AGUjqIPsA 3. https://www.youtube.com/watch?v=PfkBS9qIMRE	Lecture on Single source shortest path Q & A Session	Discussion in Forum
32	Single – Source Shortest paths General Weights		Refer Text book -1	Lecture on Single source shortest path Q & A Session	Discussion in Forum
33	Single – Source Shortest paths General Weights		Refer Text book -1	Lecture on Single source shortest path Q & A Session	Discussion in Forum

34	String Edition		Refer Text book -1	Lecture on String edition Q & A Session	Discussion in Forum	
35	String Edition		Refer Text book -1	Lecture on String edition Q & A Session	Discussion in Forum	
36	0/1 Knapsack		Refer Text book -1	Lecture on 0/1 knapsack Q & A Session	Discussion in Forum	
37	0/1 Knapsack		Refer Text book -1	Lecture on 0/1 knapsack Q & A Session	Discussion in Forum	
38	Reliability Design		Refer Text book -1	Lecture on reliability design Q & A Session	Discussion in Forum	
39	Reliability Design		Refer Text book -1	Lecture on reliability design Q & A Session	Discussion in Forum	
UNIT-V						
40	**Backtracking:** The General Method	To understand the problems using backtracking	Refer Text book -1 Refer the following videos 1. https://www.youtube.com/watch?v=kdBzkxdJ7bI 2. https://www.youtube.com/watch?v=052VkKhIaQ4 3. https://www.youtube.com/watch?v=utBfKsYUwe8	Lecture on Basics Q & A Session	Discussion in Forum	
41	The 8-Queens Problem		Refer Text book -1	Lecture on 8- queens Q & A Session	Discussion in Forum	
42	The 8-Queens Problem		Refer Text book -1	Lecture on 8- queens Q & A Session	Discussion in Forum	
43	The 8-Queens Problem		Refer Text book -1	Lecture on 8- queens Q & A Session	Discussion in Forum	
44	Sum of Subsets		Refer Text book -1	Lecture on sum of subsets Q & A Session	Discussion in Forum	
45	Sum of Subsets		Refer Text book -1	Lecture on sum of subsets Q & A Session	Discussion in Forum	
46	Graph Coloring		Refer Text book -1	Lecture on graph coloring Q & A Session	Discussion in Forum	
47	Graph Coloring		Refer Text book -1	Lecture on graph coloring Q & A Session	Discussion in Forum	
48	Hamiltonian Cycles		Refer Text book -1	Lecture on Hamiltonian cycle Q & A Session	Discussion in Forum	
49	Hamiltonian Cycles		Refer Text book -1	Lecture on Hamiltonian cycle Q & A Session	Discussion in Forum	
UNIT-VI						

50	**Branch and Bound:** The Method	To understand the FIFO & LC BB	Refer Text book -1	Lecture on BB Intro Q & A Session	Discussion in Forum
51	Least cost (LC) Search		Refer Text book -1	Lecture on LC Q & A Session	Discussion in Forum
52	The 15-Puzzle: an Example		Refer Text book -1 Refer the following videos 1. https://www.youtube.com/watch?v=3RBNPc0_Q6g 2. https://www.youtube.com/watch?v=yV1d-b_NeK8 3. https://www.youtube.com/watch?v=1FEP_sNb62k	Lecture on 15 puzzle Q & A Session	Discussion in Forum
53	Control Abstraction for LC-Search,		Refer Text book -1	Lecture on LC Search Q & A Session	Discussion in Forum
54	Bounding		Refer Text book -1	Lecture on bounding Q & A Session	Discussion in Forum
55	FIFO Branch-and-Bound		Refer Text book -1	Lecture on SBB Q & A Session	Discussion in Forum
56	LC Branch and Bound		Refer Text book -1	Lecture on LCBB Q & A Session	Discussion in Forum
57	0/1 Knapsack Problem		Refer Text book -1	Lecture on 0/1Knapsack Q & A Session	Discussion in Forum
58	LC Branch-and Bound Solution,		Refer Text book -1	Lecture on LCBB Q & A Session	Discussion in Forum
59	FIFO Branch-and-Bound Solution		Refer Text book -1	Lecture on FIFOBB Q & A Session	Discussion in Forum
60	Traveling Salesperson		Refer Text book -1	Lecture on TSP Q & A Session	Discussion in Forum
	Total No. of classes required =60				

Text Books:

Text book-1 : Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
Text book-2 : Introduction to AlgorithmsThomas H. Cormen, PHI Learning
Text book-3 : The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman.