SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Information Technology	LP: IT16401 Rev. No: 01 Date: 15.12.2017
B.Tech : Information Technology **Regulation: 2016** **Sub. Code / Sub. Name : IT16401 / Paradigms of Algorithm Design** **Unit : I**	

Unit Syllabus

FUNDAMENTALS

Algorithms - The Importance of Developing Efficient Algorithms - Analysis of Algorithms Order - Computational Complexity-sorting , searching, hashing, selection problem

Objective: To understand existing algorithms for simple computational problems, to write algorithms as pseudo-code for sorting and searching problems and compute their time complexity

Session No *	Topics to be covered	Ref	Teaching Aids
1	Algorithms - The Importance of Developing Efficient Algorithms, Writing simple algorithms – Linear Search, Matrix Operations	**I (1.1-1.2)**	**LCD/BB**
2	Analysis of Algorithms – Order - Computational Complexity-sorting ,	**I(1.3-1.4)**	**LCD/BB**
3	Insertion Sort and its Analysis	**II (2.1-2.2)**	**LCD/BB**
4	Searching – Linear Search Analysis	**Internet**	**LCD/BB**
5	Hashing	**I(8.4)**	**LCD/BB**
6	Selection Problem	**I(8.5)**	**LCD/BB**
7	Recursive Algorithms and Solving Recurrences	**I(AppendixB)**	**LCD/BB**
8	Factorial and Towers of Hanoi problems using Recursion	**Internet**	**LCD/BB**
Content Beyond Syllabus : Recursive algorithms and Analysis of Recursive algorithms			

* Session duration: 50 minutes

Unit : II

Unit Syllabus

ALGORITHM STRATEGY:

Divide-and-Conquer - Sorting -Searching- Strassen's Matrix Multiplication Algorithm Arithmetic with Large Integers. Dynamic Programming - Binomial co-efficient - Floyd's Algorithm for Shortest Paths - Chained Matrix Multiplication - Dynamic Programming and Optimization Problems- Optimal Binary Search Trees - The Traveling Salesperson Problem

Objective: To learn Divide and Conquer and Dynamic Programming strategies and apply them to solve computational problems.

Session No *	Topics to be covered	Ref	Teaching Aids
9	Divide-and-Conquer – General Strategy, Sorting -Merge Sort	**I(2.2) II (2.3.1)**	**LCD/BB**
10	Quick Sort	**I(2.4) II(Ch 7)**	**LCD/BB**
11	Searching - Binary Search, Strassen's Matrix Multiplication	**I(2.1) II(4.2)**	**LCD/BB**
12	Arithmetic with Large Integers – Large Integer Addition and Multiplication	**I(2.6)**	**LCD/BB**
13	Dynamic Programming - General Strategy, Fibonacci Series, Binomial co-efficient	**I(3.1)**	**LCD/BB**
14	DP and Optimization Problems - All Pair Shortest Path Problem - Floyd's Algorithm for Shortest Paths	**I(3.2)**	**LCD/BB**
15	Chained Matrix Multiplication	**I(3.4) II(15.2)**	**LCD/BB**
16	Longest Common Subsequence (LCS) Problem	**II(15.4)**	**LCD/BB**
17	Optimal Binary Search Trees	**I(3.5) II(15.5)**	**LCD/BB**
18	The Traveling Salesperson Problem	**I(3.6)**	**LCD/BB**
Content beyond syllabus covered (if any): Longest Common Subsequence (LCS) Problem**.**			

- Session duration: 50 mins

Unit : III

Unit Syllabus

DESIGN TECHNIQUES

Greedy Approach - Minimum Spanning Trees-scheduling - The Greedy Approach versus Dynamic Programming: The Knapsack Problem – Backtracking - Using a Monte Carlo Algorithm - The Sumof-Subsets Problem - Graph Coloring - The Hamiltonian Circuits Problem - Branch-and-Bound - Best-First Search

Objective: To learn Greedy, Backtracking and Branch & Bound techniques and apply them to solve computational problems.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Greedy Approach – General Strategy, Change Making problem	**I(p145-p148)**	**LCD/BB**
20	Minimum Spanning Trees – Prims and Kruskal Algorithms	**I(4.1) II(23.1-**	**LCD/BB**
21	Scheduling-Minimizing total time in Systems, Scheduling with Deadline	**I(4.3)**	**LCD/BB**
22	The Greedy Approach versus Dynamic Programming: The Knapsack Problem	**I(4.5)**	**LCD/BB**
23	Backtracking - General Strategy, N Queen Problem	**I(5.1-5.2)**	**LCD/BB**
24	Using a Monte Carlo Algorithm to estimate Backtracking algorithm efficiency	**I(5.3)**	**LCD/BB**
25	The Sum-of-Subsets Problem ,Graph Coloring Problem	**I(5.4-5.5)**	**LCD/BB**
26	Hamiltonian Circuit Problem,0/1 Knapsack Problem	**I(5.6-5.7)**	**LCD/BB**
27	Branch & Bound technique – General Strategy, Best-First Search	**I(6.1)**	**LCD/BB**
Content beyond syllabus covered (if any): N Queen Problem, 0/1 Knapsack Problem			

- Session duration: 50 mins

Unit : IV

Unit Syllabus

NP COMPLETENESS
NP-completeness – Polynomial Time - Polynomial Time Verification - Reducibility - NPcompleteness proofs - Approximation Algorithms - Vertex-Cover problem – Travelling-Salesman problem

Objective: To understand the difference between Polynomial and Non-Deterministic Polynomial algorithms. To get exposed to NP Complete problems

Session No *	Topics to be covered	Ref	Teaching Aids
28	Classes of algorithms – Polynomial, NP, NP Complete, NP-Hard	**I(Ch9)**	**LCD/BB**
29	NP Completeness, Polynomial Time	**II(p1049-p1053, 34.1)**	**LCD/BB**
30	Polynomial Time Verification	**II(34.2)**	**LCD/BB**
31	Reducibility	**II(34.3)**	**LCD/BB**
32	NPcompleteness proofs	**II(34.4)**	**LCD/BB**
33	NPcomplete Problems	**II(34.5)**	**LCD/BB**
34	Approximation Algorithms – Introduction	**II(p1106-1108)**	**LCD/BB**
35	Vertex Cover Problem	**II(35.1)**	**LCD/BB**
36	Travelling-Salesman problem	**II(35.2)**	**LCD/BB**
Content beyond syllabus covered (if any): NPcomplete Problems			

- Session duration: 50 mins

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Unit : V

Unit Syllabus

PARALLEL ALGORITHMS AND GENETIC ALGORITHMS

Parallel Architectures - The PRAM Model - Designing Algorithms for the CREW PRAM Model - Designing Algorithms for the CRCW PRAM Model - Genetic Algorithm - Travelling salesperson, Genetic Programming - Artificial ant and Financial trading application.

Objective: To understand Parallel Architectures and design parallel algorithms. To get exposed to genetic algorithms and Genetic Programming

Session No *	Topics to be covered	Ref	Teaching Aids
37	Parallel Architectures	**I(11.1)**	**LCD/BB**
38	The PRAM Model - Designing Algorithms for the CREW PRAM Model	**I(11.2.1)**	**LCD/BB**
39	Designing Algorithms for the CRCW PRAM Model	**I(1.2.2)**	**LCD/BB**
40	Genetic Algorithms Introduction	Internet	**LCD/BB**
41,42	Genetic Algorithm for TSP	Internet	**LCD/BB**
43	Genetic Programming Introduction	Internet	**LCD/BB**
44,45	Genetic Programming for Trading Application	Internet	**LCD/BB**

* Session duration: 50 mins

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TEXTBOOKS

1. Foundations of Algorithms,Richard E Neapolitan, 5th Edition,Jones & Bartlett Learning,2014.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.

REFERENCES

1. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press, First Edition, 2015.
2. Steven S Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2010.
3. Robert Sedgewick and Kevin Wayne, —Algorithmsl, Fourth Edition, Pearson Education, 2011.

	Prepared by	Approved by
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Date	15.12.2017	15/12/17
Remarks* :		
Remarks* :		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD