



- Constituent College of JSS Science and Technology University
- Approved by A.I.C.T.E
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- Identified as lead institution for World Bank Assistance under TEQIP Scheme



Course Title: Design and Analysis of Algorithms	Course Code: 20CS420
Credits: 4	Contact Hours (L: T: P): 52:0:0
Type of Course: Theory	Category: Professional Core Course
CIE Marks: 50	SEE Marks: 100

Pre-requisite: Data Structures.

Course Objectives: The course should enable the students to:

Sl. No.	Course Objectives
1	Introduce various design techniques and paradigms for designing algorithms.
2	Analyze the performance of various algorithms for their time and space complexity.
3	Identify, choose appropriate design technique and data structures for developing efficient algorithm for a given problem.

Unit No.	Course Content	No. of Hours
1	Introduction to Algorithms and Problem Solving: Introduction: Notion of Algorithms, Fundamentals of Algorithmic approach to problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non recursive algorithms, Examples.	12
2	Brute force and Exhaustive Search, Divide and Conquer Design Techniques: Brute Force Approaches: Introduction, Selection Sort, Bubble Sort, Sequential Search, Brute Force String Matching and Exhaustive search. Divide and conquer: General Divide and Conquer, Masters theorem, Recurrence relations, Binary Search, Merge Sort, Quick Sort, Multiplication of large integers and Strassen's Matrices.	10
3	Decrease and Conquer, Transform and Conquer, Space-Time Tradeoffs Decrease-and-Conquer Approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting. Transform-and-Conquer: Presorting, Balanced Search Trees, Heaps and Heapsort. Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching, Hashing.	10
4	Dynamic Programming and Greedy Technique: Dynamic programming: Computing binomial coefficient, Warshall's and Floyd's Algorithms, Knapsack Problem and Memory Functions. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm Dijkstra's Algorithm, Huffman Trees.	10
5	Limitations of Algorithmic Power and Coping with Limitations: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems. Coping With Limitations of Algorithmic Power: Backtracking: N-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem. Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesman Problem.	10



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Text Books:

Sl. No.	Author/s	Title	Publisher Details
1	Anany Levitin	Introduction to The Design & Analysis of Algorithms	3 rd Edition, Pearson Education, 2012

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein	Introduction to Algorithms	3 rd Edition, PHI ,2010
2	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran	Fundamentals of Computer Algorithms	2 nd Edition, Universities Press, 2013
3	R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T. Tsai	Introduction to the Design and Analysis of Algorithms A Strategic Approach	Tata McGraw Hill, 2012
4	Dave and Dave	Design and Analysis of Algorithms	2 nd Edition, Pearson

Web Resources:

Sl. No.	Web Link
1	https://nptel.ac.in/courses/106101060/
2	https://nptel.ac.in/courses/106106131/

Course Outcomes:

CO1	Use mathematical analysis model to analyse, the time complexity of iterative and recursive algorithms.
CO2	Apply brute force and divide and conquer algorithm design techniques to solve different problems and perform comparative analysis by finding time complexity.
CO3	Use Decrease and Conquer, Transform and Conquer, Space-Time Tradeoffs design strategy to solve different problems and perform comparative analysis by finding time complexity.
CO4	Solve problems such as Computing binomial coefficient, transitive closure, shortest path, Knapsack Problem using dynamic programming technique, apply Greedy technique to solve problems such minimum spanning, shortest path, encoding and perform analysis by finding time complexity.
CO5	Use decision tree to find the lower bound of searching and sorting problems and apply Backtracking / Branch and bound technique to solve various combinatorial problems.



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Mapping Course Outcomes with Program outcomes & Program Specific outcomes:

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3	-

1-Low association, 2- Moderate association, 3-High association