Syllabus

SN	21CSH-282	**Course Name:** DESIGN AND ANALYSIS OF ALGORITHM	**L**	**T**	**P**	**S**	**C**	**CH**	**Course Type**
1		Course Coordinator: Mr. Vikas Kumar	3	0	2	0	4	5	Program Core
PRE-REQUISITE		Data Structures							
CO-REQUISITE		Nil							
ANTI-REQUISITE		Nil							

a. Course Objectives:

The student will acquire knowledge on:

1. To analyze and design different algorithms based on different designing approaches.
2. To choose appropriate algorithm design techniques for solving real-time problems.
3. To apply and synthesize efficient algorithms

b. Course Outcomes

CO1	Remember and understand the basics of algorithms
CO2	Understand and apply various algorithm design paradigms.
CO3	Analyze the algorithm using different methods
CO4	Evaluating the performance of algorithms based on time and space complexity.
CO5	Design efficient algorithms for common engineering problems

c. Syllabus

Unit-1		**Contact Hours:16**
Basics of Algorithms	**Chapter -1 (Algorithm performance analysis):** Analysis Framework: Worst, Average, and Best case analysis. Asymptotic notations: Oh notation, Omega notation, Theta notation. Algorithm performance analysis: Time and Space complexity. Analysis of iterative and recursive algorithms. Recurrence equations and their solution: substitution method & master theorem, recursion tree method. **Chapter – 2 (Divide and Conquer):** Understanding of divide and conquer approach, Algorithms for Find Min and Max, Sorting: Quick Sort, 2 Way Merge Sort, heap sort. Searching: Linear Search and Binary Search. Strassen's matrix multiplication and convex hull. Decrease and Conquer Approach: Topological Sort.	
Unit-2		**Contact Hours:16**
Greedy Method and Dynamic Programming	**Chapter – 3 (Greedy Method):** Understanding of greedy approach, Greedy algorithms for Knapsack Fractional Problem, Job Sequencing Problem with the deadline, Huffman Coding. Single Source Shortest Path: Dijkstra algorithm, Minimum Spanning Tree: Prims and Kruskal Algorithm, Activity Selection problem, Graph coloring Problem. **Chapter – 4 (Dynamic Programming)**: Understanding of dynamic programming approach, Algorithms for 0/1 Knapsack problem, Longest Common Subsequence problem, Travelling Salesman Problem. Single Source Shortest Path: Bellman-Ford Algorithm. All-Pair shortest path problem: Floyd-Warshall algorithm. OBST, Coin change problem, Matrix Chain Multiplication, Subset Sum problem, Parallel Line Scheduling Problem, and The Levenshtein Distance Problem.	
Unit-3		**Contact Hours:13**
Advanced data structures and computational complexity	**Chapter – 5 (Back Tracking):** Understanding of Back Tracking, Recursive Back Tracking, Iterative Back Tracking, N-Queen's Problem, Hamiltonian Cycle, Knight's Tour Problem, Lower-Bound Theory. **Chapter – 6 (Branch & Bound):** Understanding of Branch & Bound, FIFO Branch & Bound, Least Cost Branch & Bound, 0/1 Knapsack problem using FIFO Branch & Bound and LC Branch & Bound solution. **Chapter – 7 (Computational Complexity):** Introduction to P, NP, NP-Hard and NP-Complete; Deterministic & non-deterministic algorithms.	

d. Text Books / Reference Books

T1. Fundamentals of ComputerAlgorithms 2nd Edition (2008) by Horowitz, Sahni andRajasekaran

T2. Introduction to Algorithms 3rd Edition (2012) by Thomas H Cormen, Charles E Leiserson, Ronald

REFERENCE BOOKS:

R1 :Data Structures using C and C++ by Tanenbaum, Augenstein, & Langsam 2nd Edition

	PO 1	PO 2	PO 3	PO 5	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	2	1	1	1	-	-	-	1	-	-	1	1	-	-	1
CO 2	2	2	1	2	2	1	-	1	-	1	-	1	-	1	-	-
CO 3	2	3	2	1	2	-	-	1	2	1	-	-	-	1	-	-
CO 4	2	2	2	1	2	-	-	-	-	-	1	-	-	-	1	1
CO 5	1	2	3	2	2	1	-	1	2	1	1	1	-	2	-	-

Assessment Pattern

For the **Theory Courses**, the performance of students is evaluated as follows:

Components	**Continuous Internal Assessment (CAE)**	**Semester End Examination (SEE)**
Marks	40	60
Total Marks	100	

Frequency for assessment tools for theory classes

Sr. No.	**Type of Assessment Task**	**Weightage of Actual conduct**	**Frequency of Task**	**Final Weightage of internal assessment(Prorated Marks)**
1	Assignment*	10 Marks for each assignment	One per unit	10 Marks
2	Time-bound Surprise Test	12 Marks for each test	One per semester	4 Marks
3	Quiz	4 marks for each quiz	One per Semester	4 Marks
4	Mid-Semester Test**	20 Marks for one MST	Two per semester	20 Marks
5	Presentation***	NA	As Applicable	Non-Graded Engagement Task

6	Homework	NA	One per lecture topic (of 2 questions)	Non-Graded Engagement Task
7	Discussion Forum	NA	One per chapter	Non-Graded Engagement Task
8	Attendance and Engagement Score	NA	NA	2 Marks

*Every teacher should include one innovation-based (Video/Simulation/LTI Based) assignment for the
students other than only essay-type questions.

**Mid-Semester Test to be conducted physically in examination halls. But if the COVID scenario extends, it must be conducted in Online Model via proctored examination software.

**This category may be graded in case of Seminar/Project type courses.