DESIGN AND ANALYSIS OF ALGORITHMS

Course code: 17IS4DCADA | **Credits: 04**
L: P: T: S: 4:0:0:0 | **CIE Marks: 50**
Exam Hours: 03 | **SEE Marks: 50**
Total Hours: 50

Course Objectives:

1. Identify the problem and design an algorithmic stratergy to solve it.
2. Ability to understand and use asymptotic notation to formulate the time and space complexities of algorithms.
3. Develop different algorithms for the same problem and classify them based on their complexities.
4. Acquire basic knowledge of computational complexity, approximation algorithms.

Course Outcomes

CO1	**Identifying** asymptotic runtime complexity and formulating recurrence relations of algorithms.
CO2	**Interpret** the various algorithm paradigms and optimization
CO3	**Implement** various searching and sorting algorithmic techniques.
CO4	**Implement** Dynamic programming, greedy technique, and Backtracking algorithmic technique.
CO5	**Analyze** the limitations of various algorithms and finding approximate solution to them.
CO6	**Apply and analyze** different algorithm techniques and derive its time complexity.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	-	-	-	-	-	-	-	2	3	2	-
CO2	3	3	3	1	-	-	-	-	-	-	-	2	3	2	-
CO3	3	3	3	1	-	-	-	-	-	-	-	2	3	2	1
CO4	3	3	3	1	-	-	-	-	-	-	-	2	3	2	-
CO5	3	3	3	1	-	-	-	-	-	-	-	2	3	2	-
CO6	3	3	3	2	-	-	-	-	-	-	-	2	3	2	1

Unit	Contents of the Unit	Hours	COs
1	**INTRODUCTION:** What is an algorithm, Fundamentals of Algorithmic Problem Solving. Fundamentals of the Analysis of Algorithm Efficiency: The Analysis Framework, Asymptotic and Basic Efficiency Classes, Mathematical Analysis of Non recursive, Algorithms Mathematical Analysis of Recursive Algorithms. **BRUTE FORCE:** Introduction, Bubble sort, Selection Sort, Sequential/linear Search, Brute Force String Matching.	10	CO1 CO2
2	**DIVIDE-AND-CONQUER:** Introduction, Master theorem, Quick sort, Mergesort, Multiplication of Large Integers and Strassen's Matrix Multiplication. **DECREASE-AND-CONQUER:** Introduction, Insertion Sort, Depth-First Search and Breadth-First Search, Topological Sorting, Algorithms for	10	CO3

3	**SPACE AND TIME TRADE-OFFS:** Introduction, Sorting by Counting, Input Enhancement in String Matching. **DYNAMIC PROGRAMMING:** Introduction, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.	10	CO4
4	**GREEDY TECHNIQUE:** Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes. **PRAM ALGORITHMS:** Introduction, Computational Model, Parallel Algorithms for Prefix Computation.	10	CO6
5	**LIMITATIONS OF ALGORITHM POWER:** Lower-Bound Arguments, Decision Trees, P, NP, and NP Complete Problems. **COPING WITH THE LIMITATIONS OF ALGORITHM POWER:** Backtracking & Branch-and-Bound: nqueens problem, sum of subset, assignment, problem.	10	CO5

Self study component:

Note: 1.Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

UNIT 1: Fibonacci Numbers
UNIT 2: Job Sequencing with deadlines, Defective chessboard Problem
UNIT 3: The sales person problem using dynamic programming.
UNIT 4: List Ranking and Graph Problems
UNIT 5: Approximation Algorithms for NP-Hard Problems, Hamiltonian Circuit Problem.

Text Books:

1. AnanyLevitin: Introduction to the Design & Analysis of Algorithms, 3rd Edition, Pearso Education, 2012.
2. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran: Fundamentals of Compute Algorithms, 2nd Edition, Universities Press.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction t Algorithms, 3rd Edition, PHI, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

Assessment Pattern:
CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	--	--	02	01
Understand	10	--	01	01
Apply	10	05	--	01
Analyze	05	05	02	02
Evaluate	05			
Create				

***AAT 1– Alternate Assessment Tool 1: Quiz**
AAT 2 - Alternate Assessment Tool 2: Surprise Test

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	