

DESIGN AND ANALYSIS OF ALGORITHMS
(Effective from the academic year 2018 -2019)

SEMESTER – IV

Course Code	18CS42	CIE Marks	40
Number of Contact Hours/Week	3:2:0	SEE Marks	60
Total Number of Contact Hours	50	Exam Hours	03

CREDITS –4

Course Learning Objectives: This course (18CS42) will enable students to:

- Explain various computational problem solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis.

Module 1

Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), **Performance Analysis:** Space complexity, Time complexity (T2:1.3). **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples (T1:2.2, 2.3, 2.4). **Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries. (T1:1.3,1.4).
RBT: L1, L2, L3

Contact Hours

10

Module 2

Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen's matrix multiplication (T2:3.8), Advantages and Disadvantages of divide and conquer. **Decrease and Conquer Approach:** Topological Sort. (T1:5.3).
RBT: L1, L2, L3

10

Module 3

Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2). **Single source shortest paths:** Dijkstra's Algorithm (T1:9.3). **Optimal Tree problem:** Huffman Trees and Codes (T1:9.4). **Transform and Conquer Approach:** Heaps and Heap Sort (T1:6.4).
RBT: L1, L2, L3

10

Module 4

Dynamic Programming: General method with Examples, Multistage Graphs (T2:5.1, 5.2). **Transitive Closure:** Warshall's Algorithm, **All Pairs Shortest Paths:** Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman-Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9), Reliability design (T2:5.8).
RBT: L1, L2, L3

10

Module 5

Backtracking: General method (T2:7.1), N-Queens problem (T1:12.1), Sum of subsets problem (T1:12.1), Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). **Programme and Bound:** Assignment Problem, Travelling Sales Person problem (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Programme and Bound solution (T2:8.2), FIFO Programme and Bound solution (T2:8.2). **NP-Complete and NP-Hard problems:** Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes (T2:11.1).
RBT: L1, L2, L3

10

Course Outcomes: The student will be able to :

- Describe computational solution to well known problems like searching, sorting etc.

- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design strategies for problem solving.

Question Paper Pattern:

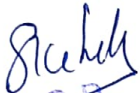
- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, 2nd Edition, 2009, Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education).


 H.O.D.
 Dept. Of Information Technology & Engineering
 Alva's Institute of Engineering & Technology
 Mijar, MOODBIDRI - 574 225