INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE**:** **Electronics and Computer Engineering**

1. Subject Code**: EC - 351**   Course Title**: Design and Analysis of Algorithms**

2. Contact Hours: **L: 3**   **T: 1**   **P: 0**

3. Examination Duration (Hrs.):   **Theory** | **0** | **3** | **Practical** | **0** | **0** |

4. Relative Weightage**: CWS** | **25** | **PRS** | **00** | **MTE** | **25** | **ETE** | **50** | **PRE** | **00** |

5. Credits**:** | **0** | **4** | 6. Semester | **√** | | |
                                      Autumn   **Spring**   **Both**

7. Pre-requisite**: EC - 251**

8. Subject Area**: DCC**

9. Objective: To familiarize students with the design strategies and bounds on the performance of different computer algorithms.

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Review of Data Structures**.	2
2.	**Program Performance**: Time and space complexity, asymptotic notation, complexity analysis, recurrence equations and their solution.	4
3.	**Algorithmic Techniques**: Algorithm design strategies, divide and conquer, merge sort, quick sort and its performance analysis, randomized quick sort, Strassen's matrix multiplication; Greedy method and its applications, knapsack problem; Dynamic programming and its performance analysis, optimal binary search trees, 0/1 knapsack problem; Traveling salesman problem; Back-tracking, n-queens problem, graph coloring, Hamiltonian cycles, knapsack problem; Branch and bound examples, 15-puzzle problem, 0/1 knapsack, traveling salesman.	14
4.	**Graph Algorithms**: DFS and BFS, spanning trees, biconnectivity; Minimum cost spanning trees: Kruskal's, Prim's and Sollin's algorithms; Path finding and shortest path algorithms; Topological sorting; Bipartite graphs.	6
5.	**Infeasibility**: P and NP-classes, NP-hard problems, reduction.	4
6.	**Parallel Algorithms**: Data and control parallelism, embedding of problem graphs into processor graphs, parallel algorithms for matrix multiplication.	6

7.	**Other Algorithms**: Number theoretic algorithms, string matching algorithms, approximation algorithms, randomized algorithms.	6
	Total	**42**

11. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1.	Sahni, S., "Data Structures, Algorithms and Applications in C++", WCB/McGraw-Hill.	2001
2.	Mchugh, J.A., "Algorithmic Graph Theory", Prentice-Hall.	1990
3.	Quinn, M.J., "Parallel Computing Theory & Practice", McGraw-Hill.	1994
4.	Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., "Introduction to Algorithms", 2nd Ed., Prentice-Hall of India.	2002
5.	Dasgupta, S., Papadimitriou, C. and Vazirani, U., "Algorithms", Tata McGraw-Hill.	2008