## 19I501 DESIGN AND ANALYSIS OF ALGORITHMS

**3 0 0 3**

**INTRODUCTION:** Role of algorithm in computing, Growth of functions, Asymptotic notations, Permutations and Combinations, Recurrences, Substitution method, Recursion tree method, Master method, Basics of Problem Classes: P, NP, NP-Complete, NP-Hard. (9)

**GREEDY METHOD:** Interval Scheduling, Matroids, Minimum spanning trees, Load Balancing, Single source shortest path method, Huffman coding. (9)

**DIVIDE AND CONQUER :** Analysis of sorting algorithms: Merge sort - Quick sort, Heap Sort, Selection sort, Binary search, Counting Inversions, Finding the Closest Pair of Points. (9)

**DYNAMIC PROGRAMMING:** Principles of Dynamic Programming, Weighted Interval Scheduling, All pairs shortest path, Optimal binary search tree, Multistage graphs, Knapsack problem. (9)

**BACKTRACKING:** Solution space and tree organization, N-queens problem, Sum of subset problem, Graph coloring, Knapsack problem, Branch and bound: 0/1 Knapsack problem, Traveling salesman problem, Assignment problem, Least Cost branch and bound. (9)

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### Total L: 45

#### TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 2nd Edition, Pearson Education, New Delhi, 2017.
2. Thomas H.Cormen, Charles Leiserson, Ron RIvest and Cliff Stein, "Introduction to Algorithms", 3rd Edition, PHI Learning Pvt Ltd, New Delhi, 2018.

#### REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press, New Delhi, 2014.
2. Steven S Skiena, "The Algorithm Design Manual", 2nd Edition, Springer, New Delhi, 2012.
3. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley Publications, New Delhi, 2014.
4. Udit Agarwal, "Algorithms Design and Analysis", 6th Edition, Dhanpat Rai & Co, New Delhi, 2017.

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| **CO** | **COURSE OUTCOMES** |
| CO1 | Analyze the complexity of an algorithm and identify its order of growth. |
| CO2 | Apply greedy algorithms to obtain near optimal solutions for the given problem. |
| CO3 | Develop a recursive solution using divide and conquer. |
| CO4 | Decompose the problem into overlapping subproblems and find the global optimal solution using dynamic programming. |
| CO5 | Explore all the possible solutions for a given problem using Backtracking and Branch & Bound. |

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| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |
| **CO2** | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |
| **CO3** | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |
| **CO4** | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |
| **CO5** | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |
|  | 3 | 3 |  |  | 2 |  |  |  | 1 | 1 |  | 2 | 3 | 3 |

## 19I510 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

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#### LIST OF EXPERIMENTS:

1. Analysis of Algorithms
2. Sorting Algorithms
3. Hashing: Collision Resolution Techniques
4. String Matching Algorithms
5. Graph Algorithms
6. Greedy Algorithms
7. Divide and Conquer
8. Dynamic programming
9. Backtracking
10. Branch and Bound

**Total P: 30**

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| **CO** | **COURSE OUTCOMES** |
| CO1 | To implement efficient algorithms for various classes of problems such as sorting, graph problems and string matching. |
| CO2 | Devise an efficient solution for any given problem using design techniques and analyze the time complexity of the same. |

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| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **P10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | 3 |  | 3 |  |  |  |  | 3 |  | 2 | 3 | 3 |
| **CO2** | 3 | 3 | 3 |  | 3 |  |  |  |  | 3 |  | 2 | 3 | 3 |
|  | 3 | 3 | 3 |  | 3 |  |  |  |  | 3 |  | 2 | 3 | 3 |