

ANALYSIS AND DESIGN OF ALGORITHMS (Common to CSE & ISE)

<b>Sub Code</b>	:	<b>06CS43</b>		<b>IA Marks</b>	:	<b>25</b>
<b>Hrs / Week</b>	:	<b>04</b>		<b>Exam Hours</b>	:	<b>03</b>
<b>Total Hrs</b>	:	<b>52</b>		<b>Exam Marks</b>	:	<b>100</b>

**PART – A**

**UNIT 1:**

1. Introduction: What is an Algorithm?, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures

**6 Hours**

**UNIT 2:**

2. Fundamentals of the Analysis of Algorithm Efficiency: Analysis Framework,
3. Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Nonrecursive and Recursive Algorithms, Example – Fibonacci Numbers

**6 Hours**

**UNIT 3:**

4. Brute Force: Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search
5. Divide and Conquer: Mergesort, Quicksort, Binary Search

**7 Hours**

**UNIT 4:**

6. Divide and Conquer *contd.*: Binary tree traversals and related properties, Multiplication of large integers and Strassen's Matrix Multiplication.
7. Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting, Algorithms for Generating Combinatorial Objects

**7 Hours**

**PART – B**

**UNIT 5:**

8. Transform and Conquer: Presorting, Balanced Search Trees, Heaps and Heapsort, Problem Reduction
9. Space and Time Tradeoffs: Sorting by Counting, Input Enhancement in String Matching

**UNIT 6:**

10. Space and Time Tradeoff *contd.*: Hashing

11. Dynamic Programming: Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

6 Hours

**UNIT 7:**

12. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees

13. Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees

7 Hours

**UNIT 8:**

14. Limitations of Algorithm Power *contd.*: P, NP and NP-Complete Problems

15. Coping with the Limitations of Algorithm Power: Backtracking, Branch-and-Bound, Approximation Algorithms for NP-Hard Problems

6 Hours

## Text Book

1. **Introduction to The Design & Analysis of Algorithms**, Anany Levitin, 2<sup>nd</sup> Edition, Pearson Education, 2007.

(Chapter 1, 2.1 to 2.5, 3.1, 3.2, 3.4, 4.1 to 4.5, 5.1 to 5.4, 6.1, 6.3, 6.4, 6.6, 7.1 to 7.3, 8.1, 8.2, 8.4, 9, 11.1, 11.2, 11.3, 12.1, 12.2, 12.3).

## Reference Books

1. **Introduction to Algorithms**, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 2<sup>nd</sup> Edition, PHI, 2006.

1. **Computer Algorithms** by Horowitz E., Sahni S., Rajasekaran S., Galgotia Publications, 2001.

1. **Introduction to the Design and Analysis of Algorithms A Strategic Approach**, R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T. Tsai, TMH, 2005.