

**Course Learning Objectives (CLOs):** This course focuses on the following learning perspectives:

- Analyze the performance of algorithms.
- Demonstrate familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.

**Course Outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12) / PSOs (13-16)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain the importance of algorithmic/mathematical approach	-	1	-

	in solving different types of problems.			
<b>CO-2</b>	<b>Analyze</b> time and space complexity for a given algorithm.	2	-	1
<b>CO-3</b>	<b>Apply</b> and <b>analyze</b> brute force technique and compare it with other techniques.	2	5	3,13
<b>CO-4</b>	<b>Apply</b> and <b>analyze</b> divide and conquer technique and compare it with other techniques.	2	5	3,13
<b>CO-5</b>	<b>Apply</b> and <b>analyze</b> greedy technique and compare it with other techniques.	2	5	3,13
<b>CO-6</b>	<b>Apply</b> and <b>analyze</b> dynamic programming technique and compare it with other techniques.	2	5	3,13
<b>CO-7</b>	<b>Apply</b> and <b>analyze</b> backtracking and branch & bound technique and compare it with other techniques.	2	5	3,13

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mapping Level	1.5	3.0	1.0	-	2.0	-	-	-	-	-	-	-	1.0	-	-	-

**Pre-requisites:** Knowledge of Discrete Mathematics and Data Structures

## Contents:

### Unit-I

**Introduction:** Algorithm, Fundamentals of problem solving, Problem types, Principles of Algorithm Design. Analysis framework, Asymptotic notations, Mathematical analysis of Non recursive algorithms, Recurrence relations; Mathematical analysis of recursive algorithms.

**Brute force strategy:** Selection Sort, Bubble sort, String matching

**7 Hrs**

### Unit-II

**Divide and Conquer:** Introduction and General method, Binary search, Merge sort, Quick sort, Matrix multiplication using Strassen's Matrix multiplication.

**Basic Traversal and search techniques:** Depth First search, Breadth First Search, Topological Sorting.

**8 Hrs**

### Unit-III

**Dynamic Programming:** Introduction and General method, Computing a binomial coefficient, Warshall's algorithm, Floyd's algorithm, Knapsack problem. **8 Hrs**

#### **Unit-IV**

**Greedy Strategy:** Introduction and General Method, Job sequencing with dead-lines, min cost spanning tree (Prim's & Kruskal's), Single Source Shortest Path. Huffman Tree. **8 Hrs**

#### **Unit-V**

**Back tracking and Branch and Bound:** Introduction General Method for both strategies Back Tracking: Sum of Sub sets, Knapsack problem, Traveling Sales person (TSP).

**Limitations of Algorithm Power:** Lower bound arguments, decision trees, P, NP and NP Complete Problems. **8 Hrs**

#### **Reference Books:**

- 1) Anany Levitin, "Introduction to the Design and analysis of algorithms", 3/E, Pearson Education, 2011
- 2) Horowitz, Sahani et.al "Fundamentals of Computer Algorithms", 2/E, Galgotia Publication, 2004.
- 3) Marks Allen Weiss, "Data Structure and Algorithm Analysis", 3/E, Pearson Education, 2009
- 4) Thomas H.Cormen, Charles E.Leiserson & Ronald L. Rivest, "Introduction to Algorithms", 2/E, Prentice Hall of India, 2003.