

<b>16MA301</b>	<b>ADVANCED DATA STRUCTURES AND ALGORITHMS</b>
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**Course Pre-requisites:** A clear understanding of basic discrete mathematics concepts and programming fundamentals

**Course Objectives:**

To impart clear knowledge to the students about fundamentals of algorithmic problem solving and framework for algorithm analysis.

To explain how to mathematically analyse recursive and non-recursive algorithms to calculate the time complexity.

To elaborate about the various algorithm design techniques and their applications

**Course Outcomes:**

Upon completion of the course, students shall have ability to

Analyse various recursive and non-recursive algorithms to compute its time complexity

Know about the various algorithm design techniques and to apply them for several practical scenarios

**Course Contents**

DESCRIPTION	TEXT BOOK	PAGES
Algorithms	T1	3-7
Fundamentals of Algorithmic problem Solving	T1	9-16
Important Problem types	T1	18-22
Analysis Framework	T1	42-50
Asymptotic Notations	T1	52-55
Basic Efficiency Classes	T1	56-68
Binary Search tree-Implementation	T3	218-228
AVL Trees	T3	228-243
Multiway search tree	T3	262-268
B Trees	T3	262-277
Red Black Trees	T3	293-310
Divide and Conquer - Introduction	T1	169 - 179
Merge Sort, Quick Sort	T1	182 - 185
Multiplication of Large Integers - Strassen's matrix multiplication	T1	187 - 191
Greedy Method- Knapsack problems	T2	197-198
Minimum cost spanning tree- Kruskal's and prim's algorithms	T2	208-220
Single Source shortest path algorithms – Dijkstra's algorithm	T2	241-248
Dynamic Programming Introduction	T1	283-290
Warshall's and Floyd's Algorithm	T1	304 - 311
Optimal Binary Search Trees	T1	297 - 302
Knapsack Problems and Memory Functions	T1	292 - 295
Back Tracking-Eight queen's problem	T1	424 - 426
Hamiltonian Cycles	T1	426 – 427
Subset Sum Problems	T1	427 - 428
Branch and Bound Algorithms	T1	432 - 433
Assignment Problem – Knapsack Problem	T1	433 - 437
Travelling Salesman Problem	T1	437 - 440
NP – Hard and NP- Complete Problems – Basic Concepts	T2	495-508
NP –Hard Problems	T1	550-552
Revision		
Self Study – Bipartite Matching, Stable Matching, Linear Programming	T1	372-383 346-357

**Total instructional hours:60**

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**Text Books:**

- T1: Anany Levitin “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 3rd Edition(Unit I to V)
- T2: Ellis Horowitz and Sahni Sartaj, “ Fundamental of Computer Algorithms”, Galgotia publications Pvt.Ltd, 2002.
- T3: Pai, GA Vijayalakshmi. Data Structures and Algorithms: Concepts, Techniques and Applications. Tata McGraw-Hill, 2008.

**REFERENCE BOOKS:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education, 2002.
2. T3: Adam Drozdek, “Data Structures and Algorithms in C++”, Vikas Publishing House Pvt.Ltd., 2002.
3. Sahni Sartaj, “ Data Structures, Algorithms and Application in C++”, WCB / Mc Graw Hill, 2000.
4. Rao, Akepogu Ananda. Data Structures and Algorithms Using C+. Pearson Education India, 2011.
5. T3: Thomas H.Cormen, Charles E. Leiserson, and Ronald L.Rivest “Introduction to Algorithms”, Tata McGraw Hill, 2002.