1	Course Code	**INT303/INT353**
2	Course Title	**Introduction To Design And Analysis Of Algorithms**
3	Credits	**5**
4	Contact Hours	**3-1-2**
5	Course Objective	The objective of this course is to teach student about the techniques for designing algorithms and provide an ability to compare and analyze various algorithms.
6	Course Outcomes	After completion of this course, the student shall be able to : 1. Apply and analyze the complexity of certain divide and conquer, greedy, dynamic programming and backtracking algorithms. 2. Analyze the criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution. 3. Modify any existing data structure to create new operations. 4. Apply backtracking and branch and bound techniques to deal with some hard problems. 5. Establish the classes P, NP, and NP-Complete problems and be able to prove that a certain problem is NP-Complete. Analyze the working of string matching algorithms.
7	Prerequisite	Data Structures, Programming in C
8	Course Contents	
8.01	Unit A	**Introduction**
8.02	Unit A Topic 1	Algorithm design paradigms- Motivation, Concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions.
8.03	Unit A Topic 2	Asymptotic Notations, Recurrences relation, Divide-and-conquer: Analysis and Structure of divide-and-conquer algorithms
8.04	Unit A Topic 3	Divide-and-conquer examples- Binary search, Quick sort, Merge sort, Strassen's Multiplication, Medians and Order Statics.
8.05	Unit B	**Dynamic Programming**
8.06	Unit B Topic 1	Overview, Difference between dynamic programming and divide and conquer
8.07	Unit B Topic 2	Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem.
8.08	Unit B Topic 3	Applications and analysis: Longest Common sub-sequence, Optimal Binary Search Tree
8.09	Unit C	**Greedy Method**
8.10	Unit C Topic 1	Overview of the Greedy paradigm, Analysis and example of exact optimization solution - Minimum Spanning Trees – Kruskal's and Prims Algorithms
8.11	Unit C Topic	Fractional Knapsack problem, Single source shortest paths, Task Scheduling Problem.

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8.12	Unit C Topic 3	Overview and analysis of Backtracking & Branch and Bound: N-Queens problem and Sum of subsets.
8.13	Unit D	**Advanced Data Structures**
8.14	Unit D Topic 1	Red-Black Trees-Definition, Applications, Insertion and deletion of elements in RB-Tree.
8.15	Unit D Topic 2	B-Trees- Definitions, Applications, Inserting/ Deleting in B-Trees.
8.16	Unit D Topic 3	Data Structure for Disjoint Sets-Definition, Operations, Applications in Kruskal's algorithm.
8.17	Unit E	**Selected Topics**
8.18	Unit E Topic 1	Introduction to NP Complete and NP Hard Problems, Examples.
8.19	Unit E Topic 2	Amortized Analysis, Approximation Algorithms – Travelling Sales Person Problem and Vertex Cover Problem.
8.20	Unit E Topic 3	Randomized Algorithms, String Matching Algorithms – Naïve String Matching Algorithm, Robin Karp Algorithm.
10	Reading Content	
9.1	Text book*	Cormen et al., "Introduction of Computer Algorithm", Prentice Hall India.
9.2	Other references	1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publications. 2. Hopcroft A, The Design And Analysis Computer Algorithms, Addison Wesley. 3. Internet as a resource for reference