COURSE FILE

For

Design and Analysis of Algorithm (ECSE210L)

Faculty Name	:	Dr. Shakti Sharma and Dr. Raghunath Reddy
Course Type	:	Core
Semester and Year	:	IV Semester and II Year
L-T-P	:	3-1-2
Credits	:	5
Department	:	Computer Science Engineering
Course Level	:	UG

SCHOOL OF ENGINEERING AND APPLIED SCIENCES

Department of Computer Science Engineering

Bennett University

Greater Noida, Uttar Pradesh

ECSE305L: Automata Theory and Computability

Course Type:	Core

L	T	P	Credits
3	1	2	5

Pre-requisites: **NA**

Course Learning Outcomes:

CLO1: Analyse the asymptotic performance of algorithms.

CLO2: Derive and solve recurrences describing the performance of divide and conquer algorithms.

CLO3: Find optimal solution by applying various methods. At much the same time, differentiate between polynomial and non-polynomial problems.

Module1 (Contact hours: 9)

Introduction to an algorithm, Mathematics for Algorithmic Sets, Functions, Algorithmic thinking, Peak finding problem. The efficient algorithm, Average, Best- and worst-case analysis, Amortized analysis, Asymptotic Notations, analysing statements. Master's theorem, Recurrence Relations.

Module 2 (Contact hours: 9)

Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort, Heap sort, Merge Sort. Divide and Conquer Algorithm: Introduction, Recurrence and different methods to solve recurrence, Problem Solving using divide and conquer algorithm. Binary Search, Matrix Multiplication and additional real-world problems.

Module 3 (Contact hours: 12)

Dynamic Programming: Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming. Matrix Chain Multiplication, all point shortest path, Case Studies. Greedy Algorithm: General Characteristics, Problem solving using Greedy Algorithm- Activity selection problem, Minimum Spanning tree problem. Graphs: Shortest paths, The Knapsack Problem, Job Scheduling Problem, Huffman code.

Module 4 (Contact hours: 12)

Applications of DFS- bi-connectivity, topological sort, Connected Components, Articulation points, topological sort. String Matching: Introduction, The naive string-matching algorithm, The Rabin Karp algorithm, Knuth Morris-Pratt algorithm. Approximation algorithms: Travelling Salesman problem, Hamiltonian problem, Vertex Cover Problem, Introduction to NP-Completeness: The class P and NP, Polynomial reduction, NP Completeness Problem, NP-Hard Problems.

Text Book:

1. "Introduction to Algorithms", by Cormen, Leiserson, Rivest, and Stein, Third Edition, 2009.

References:

1. Aho A.V., J.E. Hop croft, J.D. Ullman, Data Structures and algorithms, Addison Wesley.

2. Mark Allen Weiss, Data Structures and Algorithm Analysis.

3. MIT Opencourseware https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/index.htm

4. Corsera, course by Stanford University, on advance topics of algorithm https://www.coursera.org/learn/algorithms-npcomplete

Evaluation Components:

Components of Course Evaluation	Percentage
Mid Term Examination	25
End Term Examination	35
Lab Continuous Evaluation	10
Quiz	30