Semester 3

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
COM-301	Design and Analysis of Algorithms	PCC	4	3	1	0	50	100	150

Course Outcomes

At the end of the course the student will be able to	
CO1	Understand written algorithms in terms of their composite steps and transformations.
CO2	Analyze time and space complexity of well known algorithms.
CO3	Understand various algorithm design techniques.
CO4	Understand P, NP and NP-Complete algorithms and their characteristics.
CO5	Gain understanding of applicability of algorithms in devising optimal solutions to given problems in diverse domains.

Detailed Syllabus

Section-A

Unit 1: Mathematical preliminaries, time complexity and space complexity, worst-case and average-case analyses, use of order notations and related results, divide and conquer recurrences, recurrence relations: substitution method, recurrence trees, Master's theorem and its applications.

(12 Hrs)

Unit 2: Quick Sort and its analyses, Merge Sort recurrence, Strassen's matrix multiplication, fast multiplication of large integers, binary search trees, priority queues, Heaps and Heap Sort.

(6 Hrs)

Unit 3: Data structures for disjoint sets, Path compression, union by rank, Prim's and Kruskal's algorithms, Huffman coding, LZW coding, shortest paths, greedy activity selection, set cover and greedy heuristics.

(12 Hrs)

Section-B

Unit 4: Dynamic Programming basics, matrix-chain multiplication, DP solution for traveling salesman and 0/1 Knapsack problems, least common subsequences, independent sets and backtracking algorithm, Breadth-First and Depth-First search algorithms.

(12 Hrs)

Unit 5: Topological sort, recursive graph algorithms, string matching: KMP algorithm, Rabin-Karp algorithm, number theory algorithms: basics, GCD and extended Euclidean algorithm, primality testing. Non-Deterministic Algorithms, Polynomial Time Algorithms, NP-hard and NP-complete classes, Cook's Theorem, Introduction to Approximation Algorithms.

(12 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to Algorithms	T.Cormen, C. Lieserson, R.Rivest, C.Stein	Prentice-Hall/India	3rd (2009)
2	Algorithms	S. Dasgupta, C. Papadimitriou, Umesh Vazirani	McGraw Hill Education	1st (2017)

Reference Book

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Fundamentals of Computer Algorithms	Ellis Horowitz, Sartaj Sahni	Universities Press	2nd (2008)