GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Bachelor of Technology					Branch/Spec.	Computer Science & Engineering (CBA/CS/BDA/CSE)		
Semester	V					Version	1.2.2.2		
Effective from Academic Year		2024-25				Effective for the batch Admitted in			June 2022
Subject code	2CSE503		Subject Name			ALGORITHM ANALYSIS & DESIGN			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

Data Structures and programming

Learning Outcome:

After completion of the course, student will be able to:

- Understand the fundamentals of algorithms and finding time and space complexities
- Learn polynomial and non-polynomial problems
- Analyze and compare various algorithms and its application
- Apply appropriate Algorithm Design technique to a specific problem

Theory syllabus

Unit	Content	Hrs
1	**Fundamental of Algorithms** Requirement of algorithms, Why to analyze algorithms, Problems & instances, efficiency of algorithms, time and space complexity, average & worst-case analyses, asymptotic notation, Types of algorithms: Iterative v/s Recursive, analyzing control structures, amortized analysis, Complexity analysis of sorting algorithms	8
2	**Solving Recurrences** Generating recurrence relations from algorithms, homogeneous recurrences, inhomogeneous recurrences, change of variable, range transformations, asymptotic recurrences, substitution method, iteration method, recurrence trees, master theorem.	6
3	**Divide and Conquer** Characteristics, applications: binary search, merge sort, quick sort, matrix multiplication, counting inversion, Closest Pair of Points, MinMax.	4
4	**Greedy Algorithms** General characteristics of greedy algorithms and examples, applications: Kruskal's and Prim's algorithms, introduction to shortest path problem variants, single source shortest path problem, knapsack problem, scheduling problem, Huffman code.	7
5	**Dynamic Programming** General characteristics and examples, principle of optimality, applications: binomial coefficients, making change, knapsack problem, Floyd's algorithm, chained matrix multiplication, Longest Common Subsequence (LCS) problem, memory functions.	8

6	**Graph Algorithms** Directed acyclic graph, topological ordering & sorting, backtracking, application of backtracking: knapsack problem, Queen's problem, Branch & bound and its application.	**7**
7	**Computational Complexity** Polynomial (P) and Non Polynomial (NP) problems, NP Hard and NP Completeness, SAT problem, Traveling Salesman Problem.	**5**

Self-Study Topics :

- String Matching Algorithms

Practical content

Practicals will be based on Sorting Algorithm, Searching Algorithm, Greedy Algorithms. Dynamic Programming Algorithms. Graph Algorithms, Backtracking Algorithms.

Mooc Course

Course Name: Design and analysis of algorithms
Link: https://onlinecourses.nptel.ac.in/noc24_cs23/preview

Text Books

1	Introduction to Algorithms by Cormen, Leiserson, Rivest, Prentice Hall of India

Reference Books

1	Fundamentals of Algorithmics by Brassard &Bratley, Prentice Hall of India
2	Ellis Horowitz, SartajSahni, Fundamentals of computer algorithms, Computer Science Press
3	Design and Analysis of Algorithms, Pearson.

Course Outcomes:

COs	**Description**
CO1	Understand the fundamentals of algorithms and finding time and space complexities
CO2	Learn polynomial and non-polynomial problems
CO3	Analyze and compare various algorithms and its application
CO4	Apply appropriate Algorithm Design technique to a specific problem

Mapping of CO and PO:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	2	1	1	1	2	2	2	1
CO2	3	2	2	1	2	1	1	1	2	2	2	1
CO3	3	2	1	1	1	1	1	1	1	3	1	2
CO4	2	2	1	1	1	1	1	1	2	3	1	2