GANPAT UNIVERSITY

FACULTY OF ENGINEERING& TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Computer Engineering / Information Technology
Semester	IV	Version	2.0.0.0
Effective from Academic Year	2019-20	Effective for the batch Admitted in	July 2018
Subject code	2CEIT402	Subject Name	Design and Analysis of Algorithms

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	-	4	Theory	40	60	100
Hours	3	0	2	-	5	Practical	30	20	50

Pre-requisites:

Course on Data Structures

Learning Outcome:

After successful completion of this course, student will be able to:

- Decide best algorithm out of various alternatives.
- Analyse the performance of the algorithms for the best, average and worst case.
- Find out the time and space requirements for various algorithms and represent it using various mathematical notations.
- Understand and derive the recurrence relationship for algorithms.
- Develop various algorithms for the same problem using different design paradigms.
- Understand the different classes of the problems.

Theory syllabus

Unit	Content	Hrs
1	**Introduction:** Definition and characteristics of an algorithm, problems & instances, best, average and worst case analysis, need to look for efficiency	03
2	**Analysis of Algorithms:** Performance analysis (time & space complexity), Growth of functions, asymptotic notations (Big-oh, Omega and Theta),Sorting Algorithms and analysis (Bubble sort, Selection sort, Insertion sort), Sorting in linear time: Radix sort and Counting sort	08
3	**Solving Recurrences:** Iteration method, homogeneous recurrences, inhomogeneous recurrences, change of variable, recurrence trees, master method & master theorem	10
4	**Divide and Conquer:** Characteristics, the general template, applications: binary search, merge sort, quick sort, randomized quick sort, counting inversions, min-max problem	06
5	**Graph Algorithms:** Depth-first search, breadth-first search, topological ordering & sorting, backtracking, applications of backtracking, knapsack problem, branch & bound, application: the assignment problem	04
6	**Greedy Algorithms:** General characteristics of greedy algorithms and examples, applications: making change problem, Kruskal's and Prim's algorithms, shortest path problem, knapsack problem, scheduling problem	06
7	**Dynamic Programming:** General characteristics and examples, principle of optimality, applications: binomial coefficients, making change, knapsack problem, chained matrix multiplication	05

8	**Computational Complexity:** Introduction, information-theoretic arguments: complexity and sorting, complexity and algorithmic, introduction to NP completeness, the classes P and NP, polynomial reductions, NP complete problems	03
Practical content		
Experiments/Practicals/Simulations would be carried out based on syllabus		
Text Books		
1	Introduction to Algorithms by Cormen, Leiserson, Rivest, Prentice Hall of India	
Reference Books		
1	Fundamentals of Algorithms by Brassard & Bratley, Prentice Hall of India	
2	Ellis Horowitz, SartajSahni, Fundamentals of computer algorithms, Computer Science Press	
ICT / MOOCs		
1	https://onlinecourses.nptel.ac.in/noc18_cs20/	
2	https://nptel.ac.in/courses/106101060/	
3	https://nptel.ac.in/courses/106106131/	