

Branch Name:	COMPUTER ENGINEERING – SOFTWARE ENGINEERING
Program Code:	ET203
Course Title:	Computer Algorithms
Course Code:	2ET2030101T
Pre-requisite Course:	Fundamentals of Data Structures and Algorithms.

Course Objectives:

1. Students will develop ability to formulate computational problems in abstract and mathematically precise manner.
2. Student will gain understanding of different algorithm design paradigms such as divide and conquer, dynamic programming, greedy, backtracking and will apply suitable paradigm for designing algorithms for computational problems.
3. Students will design randomized, approximation algorithms for some computational problems.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	Basic introduction and time and space complexity analysis: Asymptotic notations (Big Oh, small oh, Big Omega, Theta notations). Best case, average case, and worst-case time and space complexity of algorithms. Overview of searching, sorting algorithms. Using Recurrence relations and Mathematical Induction to get asymptotic bounds on time complexity. Master's theorem and applications.	05	15
2	Divide and Conquer: General strategy, Problem Solving using Divide and Conquer strategy: Binary search and applications, Analyzing Quick sort, Merge sort, Matrix Multiplication Problem, Strassen's algorithm for matrix multiplication.	07	20
3	Dynamic Programming: General strategy, Binomial coefficients, Matrix Chain multiplication, Assembly Line Scheduling, Coin change problem, 0-1 Knapsack, Travelling Salesperson Problem, All pair shortest path algorithm, Longest increasing subsequence problem.	07	25
4	Greedy and Backtracking strategy: Greedy: General strategy, Analysis and correctness proof of minimum spanning tree and shortest path algorithms, fractional knapsack problem, Huffman coding, Backtracking: General strategy, n-queen problem, backtracking strategy for some NP-complete problems (e.g. graph coloring, subset sum problem, SUDOKU)	08	25
5	String Matching and NP-completeness: Naïve String Matching, Rabin Karp String Matching and String Matching with Finite Automata, Introduction to NP completeness, The class P and NP, Polynomial reductions, NP complete problems.	05	15

Text Books:

1. Introduction to Algorithms. Thomas Cormen, Charles Leiserson, Ronald Rivest. PHI publication.
2. Fundamentals of Algorithms. Gilles Brassard, Paul Bratley. PHI publication

Reference Books:

- Design Analysis and Algorithms by Hari Mohan Pandey
- Foundations of Algorithms, Shailesh R Sathe, Penram
- Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
- Fundamentals of Algorithms.-E. Horowitz et al.

List of Open-Source Software/learning website:

- <http://www.nptel.ac.in/courses/106101059/>

Course Learning Outcomes (CLO):

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the fundamental concepts problem solving algorithm, its types and the parameters to analyze those algorithms	2 Understanding 4 Analyze
CLO2	Apply Brute Force method and Divide and Conquer method to solve computing problems.	1 Remembering 3 Applying
CLO3	Apply the dynamic programming and greedy techniques to solve computing problems.	2 Understanding 3 Applying
CLO4	Describe how scientific problems can be solved using iterative method and how to cope with limitations of algorithm power.	3 Applying, 2 Understanding
CLO5	Critically analyze the different algorithm design techniques for a given problem based on its time and space complexity.	5 Evaluate , 3 Applying 4 Analyze
CLO6	Modify existing algorithms to improve efficiency	6 Creating

Mapping of CLO with PO and PSO:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	L	L	-	-	-	-	-	-	-	-	-	H	M	-	-
CLO2	M	L	L	-	-	-	-	-	-	-	-	-	H	M	-	-
CLO3	M	L	L	-	-	-	-	-	-	-	-	-	H	M	-	-
CLO4	M	L	L	-	-	-	-	-	-	-	-	-	M	M	-	-
CLO5	H	M	M	-	-	-	-	-	-	-	-	-	M	-	M	-
CLO6	H	M	M	-	-	-	-	-	-	L	-	M	-	M	-	-

H: High, M: Medium, L: Low

