Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	B.Tech. (Computer Science & Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	
Course Name	Design and Analysis of Algorithm
Desired Requisites:	Data structure

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	To illustrate and apply the algorithm analysis techniques.
2	To discuss the efficient algorithm for various problem
3	To explain and demonstrate different algorithm techniques for real world problem
4	To compute and prove complexity class of various algorithm techniques
5	

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Discuss the fundamentals of algorithm design and analysis techniques.	Understanding
CO2	Apply knowledge of computing and mathematics to algorithm design	Applying
CO3	Critically analyze the various algorithm design techniques for a given problem.	Analyzing
CO4	Classify computational problems into P, NP, NP-Hard and NP-Complete.	Evaluating
CO5	Design efficient algorithms to improve complexity of existing algorithm.	Creating

Module	**Module Contents**	**Hours**
I	**Introduction** Introduction to Algorithm Analysis Time and Space Complexity, Elementary operations and Computation of Time Complexity-Best, worst and Average Case Complexities- Complexity Calculation of simple algorithms. Recurrence Equations: Solution of Recurrence Equations – Iteration Method and Recursion Tree Methods. Master's theorem for complexity computation.	6
II	**Divide and conquer** Binary Search, Merge sort , Quick sort , Heap Sort , Multiplication of Large Integers, Closest-Pair and Convex, Hull Problems, Strassen's Matrix Multiplication.	7
III	**Greedy Technique** Greedy Technique – Container loading problem, Job sequencing with deadlines, Minimum cost spanning trees, Knapsack problem, Optimal Merge pattern, Huffman Trees.	6
IV	**Dynamic Programming** Principle of optimality – Coin changing problem, Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph – Optimal Binary Search Trees – 0/1 Knapsack problem and Memory functions.	7

V	**Backtracking** Backtracking-General method, applications The 4, 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.	6
VI	**Graph Traversal Techniques & Class of problem** Techniques for Graphs – Breadth First Search & Traversal, Depth First Search & Traversal, Topological sorting of DAGs AND/OR graphs, Connected components P, NP, NP- Complete and NP Hard Problems, Approximation Algorithms for NP-Hard Problems.	7

Text Books	
1	Ellis Horowitz, Sartaj Sahni and Rajasekaran "Fundamentals of Computer Algorithms" , Galgotia Publications, 2nd Edition.
2	Aho, Hopfcraft and Ullman, Addison Wesley "Design and Analysis of Algorithms",
References	
1	Thomas Cormen, Leiserson, Rivest, and Stein "Introduction to Algorithms", PHI Publication. 3rd Edition, 2009
2	Goodman ,"Introduction to Design and Analysis of Algorithm", McGraw Hill.
3	R.C.T. Lee, S.S. Tseng, R.C. Chang, "Introduction to the Design and Analysis of Algorithm", Tata
Useful Links	
1	https://online.stanford.edu/courses/soe-ycsalgorithms1-algorithms-design-and-analysis-part-1

CO-PO Mapping															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	--	--	--	--	--	--	--	--	--	--	--	--	--	
CO2	3	1	--	--	--	--	--	--	--	--	--	--	--	--	
CO3	--	3	--	2	--	--	--	--	--	--	--	--	--	--	
CO4	--	--	--	2	--	--	--	--	--	--	--	--	--	--	
CO5	--	--	3	--	--	--	--	--	--	--	--	--	--	--	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.															

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	5		15
3	Apply	5	8	15	28
4	Analyze	5	7	20	32
5	Evaluate			15	15
6	Create			10	10
Total		**20**	**20**	**60**	**100**