PSN College of Engineering and Technology (Autonomous)

Tirunelveli - 627152

Course File

Subject Code : 503008

Subject Name : DESIGNANDANALYSISOFALGORITHMS

Regulation : 2018

Semester : 04

Academic Year : 2022-2023

Department : CSE

Degree & Programme : B.E and CSE

Prepared By

Name : Mrs.J.Yamuna Bee
Designation : Assistant Professor
Department : CSE

VISION AND MISSION OF THE INSTITUTE:

Institution Vision	To emerge as a pioneer institute inculcating engineering education, skills, research, values and ethics	
Institution Mission	**IM-1**	● To achieve greater heights of excellence in technical knowledge and skill development through innovative teaching and learning practices.
	IM-2	● To develop the state of art infrastructure to meet the demands of technological revolution.
	IM-3	● To improve and foster research in all dimensions for betterment of society.
	IM-4	● To develop individual competencies to enhance innovation, employability and entrepreneurship among students.
	IM-5	● To instill higher standards of discipline among students, inculcating ethicaland moral values for societal harmony and peace.

VISION AND MISSION OF THE DEPARTMENT:

Department Vision	To emerge as a preeminence program to produce quality Computer Science and Engineering graduates.	
Department Mission	**DM-1**	To enhance professional and entrepreneurial skills through industry institute interaction to enable them in getting better placement
	DM-2	To promote research and continuing education
	DM-3	To train the students according to their discipline to meet dynamic needs of the society

1. **PRE REQUISITES**
   Data Structure and Fundamentals of Algorithms

2. **COURSE DESCRIPTION**
   Algorithm design and analysis provide the theoretical backbone of computer science and are a must in the daily work of the successful programmer. The goal of this course is to provide a solid background in the design and analysis of the major classes of algorithms.

3. **CARRIER OPPORTUNITIES:**
   1. Junior IT Business Analyst/ Project Manager
   2. Airport Applications Analyst

4.SYLLABUS

UNIT–I	**INTRODUCTION**	**Hrs**
Algorithm–Fundamentals of Algorithmic Problem Solving–Important ProblemTypes–Analysis Framework–AsymptoticNotationsandBasicEfficiencyClasses–MathematicalAnalysisofNon-recursiveAlgorithms-MathematicalAnalysisofRecursive Algorithms		**9**
UNIT-II	**DIVIDEANDCONQUERTECHNIQUES**	**Hrs**
DivideandConquer:MergeSort–QuickSort–BinaryTreeTraversals-Decreaseand Conquer:InsertionSort–BinarySearch–SearchingandInsertioninaBinarySearchTree.		**9**
UNIT-III	**DYNAMICPROGRAMMING**	**Hrs**
DynamicProgramming:ThreeBasicExamples-ComputingBinomialCoefficient–Warshall'sAlgorithm-Floyd'salgorithms–OptimalBinarySearchtree-Knapsack ProblemandMemoryfunctions		**9**
UNIT –IV	**GREEDYTECHNIQUE&BACKTRACKING**	**Hrs**
GreedyTechnique:Prim'sAlgorithm–Kruskal'sAlgorithm–Dijikstra'sAlgorithm-Backtracking:n-queensProblem–HamiltonianCircuitProblem-Subset-sumproblem		**9**
UNIT–V	**BRANCH ANDBOUND&APPROXIMATIONALGORITHMS**	**Hrs**
BranchandBound:Lower–BoundArguments-AssignmentProblem–KnapsackProblem – Hamiltonian circuitproblem-Traveling Salesman Problem ApproximationAlgorithms:PandNPProblems–NPCompleteproblems–NPHardProblems-ApproximationalgorithmsforNP-HardProblems:TravelingSalesmanProblem,KnapsackProblem		**9**

Total:45Period

ListofExperiments

1. Implementarecursivealgorithmfor computingfactorialofanumber
2. ImplementMergesortalgorithmusingDivideandConquerTechnique
3. ImplementBinarySearchalgorithmusingDecreaseandConquer Technique
4. ComputeBinomialCoefficientusingDynamicProgrammingTechnique
5. ImplementWarshall'salgorithmusingDynamicProgrammingTechnique

6. ImplementPrim’salgorithmusingGreedyTechnique
7. ImplementasolutionfOr8-QueensproblemusingBacktrackingTechnique
8. Implement asolutionforAssignmentproblemusingBranch-and-BoundTechnique
9. ImplementanapproximatealgorithmforTravellingSalesmanProblem

5. COURSE OUT COMES

CO's	CO – STATEMENTS	Blooms level	PO's
CO 1	Interpret thefundamentalneedsofalgorithms inproblemsolving	K2	1,2,34,5,12
CO 2	Classifythedifferent algorithmdesigntechniquesforproblemsolving	K2	1,2,4,5,12
CO 3	Developalgorithmsforvariouscomputingproblems	K6	1,3,4,5,12
CO 4	Analysethetimeandspacecomplexityofvariousalgorithms	K4	1,2,5,12
CO 5	Identifythelimitationsofalgorithms inproblemsolving	K3	1,2,3,5,12

6. INSTRUCTIONAL LEARNING OUTCOMES

UNIT	LEARNING OUTCOMES
I	The outcome will be assess through assignment-1, tutorial-1, Class test -1, MCQ Test-1,CAT-1.
II	The outcome will be assess through assignment-2, tutorial-2, Class test -2, MCQ Test-2, CAT-1, CAT – 1&2.
III	The outcome will be assess through assignment-3, tutorial-3, Class test -3, MCQ Test-3,CAT-2.
IV	The outcome will be assess through assignment-4, tutorial-4, Class test -4, MCQ Test-4,CAT-3.
V	The outcome will be assess through assignment-5,tutorial-5,Classtest-5,MCQTest-4, CAT-3. Test-5.

7. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

S. No	Objective	PEOs
PEO1	**Fundamental Knowledge**	To impart Knowledge on the fundamental principles of mathematics, science, and sub-disciplines in the field of Engineering
PEO2	**Career Development**	To make them undergo industrial training, and Professional development courses inculcating the habit of perpectual learning for career development.
PEO3	**Social Identity**	To develop effective communication skills and make them socially responsible to work cooperatively in all environments.

8. PROGRAM OUTCOMES [PO's]

PO's No	KNOWLEDGE	STATEMENTS	APPLIANCE
1	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	Theory/ Practical / Project work
2	Problem Analysis	Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Theory / Practical / Projects
3	Design / Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	Theory / Practical / Projects
4	Conduct Investigations of Complex Problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Theory / Practicals
5	Modern Tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	Theory / Practical / Project work
6	The Engineer and Society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	Theory / Industrial visit / In plant training
7	Environment and Sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	Theory / Industrial Visit/ In plant Training
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Theory / Industrial visit / In plant training

9	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Projects
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Projects/ Seminar/ Mini Project
11	Project Management and Finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Projects
12	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Projects / Higher Studies

9. PROGRAMME SPECIFIC OBJECTIVE (PSO's)

PSO1	Proficient and Innovative with a strong cognizance in the IOT, through the application of acquired knowledge and skills.
PSO2	Design and Implement IOT based solutions for improving operational efficiency by investigating existing industrial environment.

10. CO- PO MAPPING

O's O	**COURSE OUTCOME**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PS
O1	Interpret thefundamentalneedsofalgorithms inproblemsolving	2	2	2	2	2							1		
O2	Classifythedifferent algorithmdesigntechniquesforproblemsolving	3	2		2	2							1		
O3	Developalgorithmsforvariouscomputingproblems	3		2	2	2							2		
O4	Analysethetimeandspacecomplexityofvariousalgorithms	3	2			2							2		

O5	Identifythelimitationsofalgorithms inproblemsolving	2	2	2		2							2		

11. TEXT BOOK & REFERENCE BOOK LIST

Sl. No	Description	Legend
Text Book(s):		
1	AnanyLevitin,"IntroductiontotheDesignAndAnalysisofAlgorithms",ThirdEdition,PearsonEducation,2012(UNITI-V)	T1
Reference Book(s):		
1	AlfredV.Aho,JohnE.Hopcroft,JeffreyD.Ullman"TheDesignandAnalysisofComputerAlgorithms",1st Edition	R1
2	Sachin Dev Goyal, "Design and Analysis of Algorithm", First edition, University SciencePress,2009	R2
	Parag Himanshu Dave,HimanshuBalachandraDave,"DesignAndAnalysisofAlgorithms",PearsonEducation,2011	R3

12. Web Resources

Sl. No	Topic	Web link
1.	Data Structures and Algorithms	https://www.pepcoding.com/resources/

13. E- learning / NPTEL

NPTEL/ OTHER UNIVERSITY video lectures related to syllabus:	
Video	https://nptel.ac.in/courses/106106131
Lecture Notes	https://www.vssut.ac.in/lecture_notes/lecture1428551222.pdf

14. MAGAZINE & JOURNALS

Magazine	https://link.springer.com/book/10.1007/978-3-642-34862-4
Journals	https://stmjournals.in/international-journal-of-algorithms-design-and-analysis/

15. LESSON PLAN

S. No.	Unit	Topic to be covered	Hours Needed	Mode of Teaching (BB/PPT/Others)	Text/ Ref. Book	Page No.
		INTRODUCTION				
1	I	Algorithm–FundamentalsofAlgorithmicProblem Solving	1	BB	Text Book	3
2		ImportantProblemTypes–AnalysisFramework	2	BB	Text Book	7
3		AsymptoticNotationsandBasicEfficiencyClasses	2	BB	Text Book	19
4		MathematicalAnalysisofNon-recursiveAlgorithms	2	BB	Text Book	22
5		MathematicalAnalysisof Recursive Algorithms	2	BB	Text Book	25
		DIVIDEANDCONQUERTECHNIQUES			Text Book	
6	II	DivideandConquer:MergeSort	1	BB	Text Book	93
7		QuickSort	2	BB	Text Book	125
8		BinaryTreeTraversals	2	BB	Text Book	128
9		Decreaseand Conquer:InsertionSort	1	BB	Reference book1	80

10		BinarySearch	1	BB	Text Book	135
11		SearchingandInsertioninaBinarySearchTree	2	BB	Text Book	183
		Radix sort*	1	BB	Google	-

		DYNAMICPROGRAMMING			Text Book	
12	III	DynamicProgramming:ThreeBasicExamples	1	BB	Text Book	307
13		ComputingBinomialCoefficient	1	BB	Text Book	215
14		Warshall'sAlgorithm	2	BB	Text Book	221
15		Floyd'salgorithms	2	BB	Text Book	232
16		OptimalBinarySearchtree	2	BB	Reference book 2	115
17		Knapsack ProblemandMemoryfunction	1	BB	Text Book	390
		Job Sequencing with DeadlineZ*	1	BB	Google	-
		GREEDYTECHNIQUE&BACKTRACKING			Text Book	
18	IV	GreedyTechnique:Prim'sAlgorithm	1	BB	Text Book	400
19		Kruskal'sAlgorithm	2	BB	Text Book	405
20		Dijikstra'sAlgorithm	2	BB	Reference Book 2	135
21		Backtracking:n-queensProblem	1	BB	Text Book	410
22		HamiltonianCircuitProblem	2	BB	Text Book	424
23		Subset-sumproblem	1	BB	Text Book	428
		BRANCH ANDBOUND&APPROXIMATIONALGORITHMS			Text Book	
24	V	BranchandBound:Lower	1	BB	Text Book	435
25		BoundArguments-AssignmentProblem	1	BB	Text Book	460
26		KnapsackProblem – Hamiltonian circuitproblem	2	BB	Text Book	472
27		Traveling Salesman Problem ApproximationAlgorithms	2	BB	Reference book2	150

28		PandNPProblems– NPCompleteproblems–NPHardProblems	1	BB	Text Book	481
29		ApproximationalgorithmsforNP-HardProblems	1	BB	Text Book	490
30		TravelingSalesmanProblem,KnapsackProblem	1	BB	Text Book	495
31		Design and Analysis Multistage Graph*	1	BB	Google	-
	Total Hours Needed =45Hours+3hours					

Signature	Prepared By		
NAME	**Mrs. J.Yamuna Bee**	**Dr.M.Vargheese**	**Dr.V.Manikandan**
Designation	Asst.Prof. / CSE	HOD/ CSE	Principal