EASWARI ENGINEERING COLLEGE, CHENNAI-600 089

DEPARTMENT OF INFORMATION TECHNOLOGY

LESSON PLAN

SUBJECT CODE : CS 6402

SUBJECT TITLE : DESIGN AND ANALYSIS OF ALGORITHMS

HOURS DISTRIBUTION : (L T P C 3 0 0 3)

COURSE/ BRANCH : B.Tech. (I.T.)

SEMESTER : IV

ACADEMIC YEAR : 2014 - 2015

FACULTY NAME : MIJULA NAVIS J

OBJECTIVE OF THE COURSE :

- Learn the algorithm analysis techniques.
- Become familiar with the different algorithm design techniques.
- Understand the limitations of Algorithm power.

OUTCOME OF THE COURSE :

Upon understanding this course the students will be able to

1. Design algorithms for various computing problems.
2. Analyze the time and space complexity of algorithms.
3. Critically analyze the different algorithm design techniques for a given problem.
4. Modify existing algorithms to improve efficiency

PREREQUISTE **:** KNOWLEDGE IN DATA STRUCTURES

UNITS	TOPIC NO	TOPIC	PERIOD	BOOKS REFERRED	PAGE NO
I	**UNIT-I (9)**				
	INTRODUCTION				
	OBJECTIVE: TO UNDERSTAND, ANALYSE ALGORITHMS AND SOLVE RECURSIVE AND NON RECURSIVE ALGORITHMS				
	1	Notion of an Algorithm	1	T1	1-7
	2	Fundamentals of Algorithmic Problem Solving	2	T1	9-16
	3	Important Problem Types	3	T1	17-22
	4	Fundamentals of the Analysis of Algorithm Efficiency	4	T1	39
	5	Analysis Framework	5	T1	40-48
	6	Asymptotic Notations and its properties	6	T1	49-56
	7	Mathematical analysis for Recursive algorithms	7	T1	65-72
	8	Mathematical analysis for Non recursive algorithms	8	T1	57-63
	9	Mathematical analysis for Recursive and Non recursive algorithms – problems	9	T1	63,72

II	**UNIT-II (9)**				
	BRUTE FORCE AND DIVIDE AND CONQUER				
	OBJECTIVE:TO UNDERSTAND AND APPLY BRUTE FORCE AND DIVIDE AND CONQUER TECHNIQUES				
	1	Brute Force – Introduction- Selection sort, Bubble sort Closest Pair and Convex Hull Problems	10	T1	93,94,96 102-106
	2	Exhaustive Search - Traveling Salesman Problem	11	T1	108-110
	3	Exhaustive Search - Knapsack Problem	12	T1	110
	4	Exhaustive Search - Assignment problem.	13	T1	110-113
	5	Divide and conquer methodology – Introduction Merge sort	14	T1	117 119-121
	6	Quick sort	15	T1	123-127
	7	Binary search	16	T1	128-131
	8	Multiplication of Large Integers - Strassen's Matrix Multiplication	17	T1	137-141
	9	Divide and conquer methodology – Closest Pair and Convex Hull Problems.	18	T1	142-146

III	**UNIT-III (9)**				
	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE				
	OBJECTIVE:TO UNDERSTAND AND APPLY DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE				
	1	Dynamic Programming- Introduction Computing a Binomial Coefficient	19	T1	265 266-268
	2	Warshall's and Floyd' algorithm	20	T1	270-277
	3	Optimal Binary Search Trees	21	T1	278-282
	4	Knapsack Problem and Memory functions	22	T1	284-287
	5	Greedy Technique - Introduction	23	T1	291-292
	6	Prim's algorithm	24	T1	292-296
	7	Kruskal's Algorithm	25	T1	298-304
	8	Dijkstra's Algorithm	26	T1	305-309
	9	Huffman Trees.	27	T1	311-314

IV	**UNIT-IV (9)**				
	ITERATIVE IMPROVEMENT				
	OBJECTIVE:TO STUDY,UNDERSTAND AND APPLY NETWORK FLOW AND ITS APPLICATIONS				
	1	The Simplex Method - Introduction	28	T1	318
	2	The Simplex Method – Interpretation of Linear Programming	29	T1	319-331
	3	The Maximum Flow Problem - Introduction	30	T1	333
	4	The Maximum Flow Problem - Algorithm	31	T1	333-343
	5	The Max Flow Min cut - Problems	32	T1	343-345
	6	Maximum Matching in Bipartite Graphs- Algorithm	33	T1	345-349
	7	Maximum Matching in Bipartite Graphs- Problems	34	T1	349-351
	8	The Stable Marriage Problem - Algorithm	35	T1	353-355
	9	The Stable Marriage Problem - Problems	36	T1	354-356

V	**UNIT-V (9)**				
	COPING WITH THE LIMITATIONS OF ALGORITHM POWER				
	OBJECTIVE: TO STUDY UNDERSTAND AND APPLY BRANCH AND BOUND , APPROXIMATION TECHNIQUES				
	1	Limitations of Algorithm power – Lower Bound arguments – Decision Trees	37	T1	359 360,366
	2	P, NP and NP – Complete Problems Coping with the Limitations	38	T1	372-380 393
	3	Backtracking –n-Queens problem	39	T1	393,395
	4	Hamiltonian Circuit Problem	40	T1	396-397
	5	Subset Sum Problem	41	T1	397-398
	6	Branch and Bound - Introduction Assignment problem	42	T1	402 403-435
	7	Branch and Bound - Knapsack Problem Traveling Salesman Problem	43	T1	405-408 408-409
	8	Approximation Algorithms for NP – Hard Problems	44	T1	411
	9	Approximation Algorithms -Knapsack problem Traveling Salesman problem.	45	T1	423-427 413-423

ASSIGNMENT TOPICS

SL.NO	ASSIGNMENT TOPICS	SUBMISSION DUE
1	OPTIMAL BINARY SEARCH TREES	**Feb 15 2014**
2	THE MAXIMUM FLOW PROBLEM, SMP	**March 15 2014**

CONTENT BEYOND SYLLABUS

SL.NO	TOPICS
1	MULTISTAGE GRAPH

TEXT BOOK:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.
4. http://nptel.ac.in/

FACULTY **HOD**

PROGRAMME EDUCATIONAL OBJECTIVES

1. Graduates will be proficient in utilizing the fundamental knowledge of basic sciences and mathematics to the applications relevant to various streams of Engineering and Technology.
2. Graduates will possess core competencies necessary for application of knowledge of computers and telecommunications equipment to store, retrieve, transmit, manipulate and analyze data in the context of business enterprise.
3. Graduates will be capable of thinking logically, pursue lifelong learning and will have the capacity to understand technical issues related to computing systems and design optimal solutions.
4. Graduates will be able to develop hardware and software systems by understanding the importance of social, business and environmental needs in the human context.
5. Graduates will gain employment in organizations and establish themselves as professionals by applying their technical skills to solve real world problems and meet the diversified needs of industry, academia and research.
6. Graduates will be aware of professional ethics of the software industry and equip themselves with communication skills essential for working in community.

PROGRAMME OUTCOMES (a-l)

(a) Ability to apply knowledge of computing and mathematics appropriate to Information Technology
(b) Ability to analyze a problem, and identify computing requirements appropriate to its solution
(c) Ability to design, implement, and evaluate a system, process, component, or program to meet specific requirements
(d) Ability to interpret and synthesis data to provide valid conclusions
(e) Ability to function effectively as a team member to achieve a common goal
(f) Ability to understand professional, ethical and social issues and responsibilities
(g) Ability to communicate effectively with a diverse groups
(h) Ability to analyze the local and global impact of Information Technology on society
(i) Ability to recognize and engage in continuing professional development and lifelong learning
(j) Ability to use current techniques, skills, and tools necessary to accomplish projects related to Information Technology.
(k) Ability to understand the impact of the professional engineering solutions in societal and environmental contexts for sustainable development.
(l) Ability to understand engineering and management principles to manage projects in multidisciplinary environment.

MAPPING OF COURSE OUTCOMES WITH PEO & THE PO FOR DESIGN AND ANALYSIS OF ALGORITHM (CS6402)

UNITS	*Course outcome*	***PEO 1***	***PEO 2***	***PEO 3***	***PEO 4***	***PEO 5***	***PEO 6***	***PO a***	***PO b***	***PO c***	***PO d***	***PO e***	***PO f***	***PO g***	***PO h***	***PO i***	***PO j***	***PO k***	***PO l***
INTRODUCTION	Design algorithms for various computing problems.	S	S	M	S	M	M	S	S	S	S	S	W	M	W	M	M	M	W
	Analyze the time and space complexity of algorithms.	S	S	M	M	M	M	S	S	S	S	M	W	W	W	S	M	S	M
	Critically analyze the different algorithm design techniques for a given problem.	S	S	W	W	M	W	S	S	S	S	S	M	M	M	W	W	S	W
	Modify existing algorithms to improve efficiency	S	S	S	S	M	M	S	S	S	S	S	W	W	M	S	S	S	W
BRUTE FORCE AND DIVIDE AND CONQUER	Design algorithms for various computing problems.	S	S	M	S	M	M	S	S	S	S	S	W	M	W	M	M	M	M
	Analyze the time and space complexity of algorithms.	S	S	M	M	M	M	S	S	S	S	M	W	W	W	S	M	S	W
	Critically analyze the different algorithm design techniques for a given problem.	S	S	W	M	M	W	S	S	S	S	S	M	M	M	W	W	S	W
	Modify existing algorithms to improve efficiency	S	S	S	S	M	M	S	S	S	S	S	W	W	M	S	S	S	M
DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	Design algorithms for various computing problems.	S	S	M	S	M	M	S	S	S	S	S	W	M	W	M	M	M	W
	Analyze the time and space complexity of algorithms.	S	S	M	M	M	M	S	S	S	S	M	W	W	W	S	M	S	W
	Critically analyze the different algorithm design techniques for a given problem.	S	S	W	M	M	W	S	S	S	S	S	M	M	M	W	W	S	W
	Modify existing algorithms to improve efficiency	S	S	S	S	M	M	S	S	S	S	S	W	W	M	S	S	S	W

ITERATIVE IMPROVEMENT	Design algorithms for various computing problems.	S	S	M	S	M	M	S	S	S	S	S	W	M	W	M	M	M	W
	Analyze the time and space complexity of algorithms.	S	S	M	M	M	M	S	S	S	S	M	W	W	W	S	M	S	W
	Critically analyze the different algorithm design techniques for a given problem.	S	S	W	M	M	W	S	S	S	S	S	M	M	M	W	W	S	W
	Modify existing algorithms to improve efficiency	S	S	S	S	M	M	S	S	S	S	S	W	W	M	S	S	S	W
COPING WITH THE LIMITATIONS OF ALGORITHM POWER	Design algorithms for various computing problems.	S	M	M	S	M	M	S	S	S	S	S	W	M	W	M	M	M	W
	Analyze the time and space complexity of algorithms.	S	M	M	M	M	M	S	S	S	S	M	W	W	W	S	M	S	W
	Critically analyze the different algorithm design techniques for a given problem.	S	S	W	M	M	W	S	S	S	S	S	M	M	M	W	W	S	W
	Modify existing algorithms to improve efficiency	S	S	S	S	M	M	S	S	S	S	S	W	W	M	S	S	S	W

STRONG	S
MEDIUM	M
WEAK	W