BHARATI VIDYAPEETH'S
INSTITUTE OF COMPUTER APPLICATIONS & MANAGEMENT (BVICAM)
(Affiliated to Guru Gobind Singh Indraprastha University, Approved by AICTE, New Delhi)
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LESSON PLAN

Course: MCA-201 – Design and Analysis of Algorithms	
MCA – 3rd Semester	**No. of Theory Hours per Week: 04**

Course Outcomes (COs):

CO #	Detailed Statement of the CO
CO1	Demonstrate P and NP complexity classes of the problem. (BTL2)
CO2	Apply the concepts of asymptotic notations to analyze the complexities of various algorithms. (BTL4)
CO3	Analyze and evaluate the searching, sorting and tree-based algorithms. (BTL5)
CO4	Design efficient solutions using various algorithms for given problems. (BTL6)
CO5	Develop innovative solutions for real-world problems using different paradigms. (BTL6)

Recommended Books:

Books	S. No.	Details of the Books
Text Books	1.	T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI, 2nd Edition, 2006. **[TB1]**
	2.	S. Dasgupta, C. Papadimitriou and U.Vazirani, "Algorithms", McGraw Hill Higher Education, 1st Edition, 2017. **[TB2]**
	3.	J. Kleinberg and E. Tardos, "Algorithm Design", Pearson Education, 2nd Edition, 2009. **[TB3]**
Reference Books	1.	S. Horowitz, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008. **[RB1]**
	2.	R. Panneerselvam, "Design and Analysis of Algorithms", PHI, 2nd Edition, 2016. **[RB2]**
	3.	T. H. Cormen, "Algorithms Unlocked", MIT Press, 1st Edition, 2013. **[RB3]**
	4.	R. Neapolitan and K. Naimipour, "Foundations of Algorithms", Jones & Bartlett Publishers, 4th Edition, 2010. **[RB4]**
	5.	A. Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd Edition, 2012. **[RB4]**

Lesson Plan for Theory:

Lecture No.	Topics/Concepts to be Covered	Reference of the Book and its Chapter
	UNIT - I	
1.	Algorithm Specification	TB1 [Chapters 1-5]; TB2 [Chapters 0-2]; TB3 [Chapters 2, 5, 13]
2.	Performance Analysis: Space and Time Complexity	
3.	Performance Analysis: Space and Time Complexity	
4.	Performance Analysis: Space and Time Complexity	
5.	Performance Analysis: Space and Time Complexity	
6.	Correctness of Algorithms	
7.	Growth of Functions	
8.	Asymptotic Notations and Types	
9.	Concept of Randomized Algorithms	
10.	Recurrences: Substitution, Iteration	
11.	Master and Recurrence Tree method	
	UNIT – II	
12.	Problem Solving,	TB1 [Chapters 7-9, 13, 21 28, 32]; TB2 [Chapter 2]; TB3 [Chapter 5]
13.	Comparative Analysis of different Sorting and Searching Techniques	
14.	Strassen's Matrix Multiplication Method	
15.	Sorting in linear time: Counting Sort, Bucket Sort and Radix Sort	
16.	String Matching Concept: Naive String-Matching Algorithm	
17.	String Matching with Finite Automata	
18.	Knuth Morris Pratt Algorithm	
19.	The Rabin-Karp Algorithm	
20.	Red Black Trees, Disjoint Set and their Implementation	
21.	Medians and Order Statistics	
22.	Medians and Order Statistics	
	UNIT – III	
23.	Greedy Algorithms: General Concept	TB1 [Chapters 15-16 & 23-25]; TB2 [Chapters 4-6];
24.	Applications, Activity Selection Problem	
25.	Fractional Knapsack problem	

Lecture No.	Topics/Concepts to be Covered	Reference of the Book and its Chapter
26.	Job Sequencing with Deadlines	TB3 [Chapters 4, 6]
27.	Huffman Coding, Analysis and Correctness of Prim's, Kruskal Algorithm and Dijkstra Algorithm	
28.	Dynamic Programming: General Concept, Matrix-Chain Multiplication Problem, Longest Common Subsequence Problem	
29.	Bellman-Ford Algorithm	
30.	Analysis and Correctness of Floyd-Warshall Algorithm	
31.	Optimal Binary Search Trees	
32.	0/1 Knapsack Problem	
33.	Network Flow Problem	
UNIT - IV		
34.	Backtracking: n-Queen's Problem	TB1 [Chapters 34, 35]; TB2 [Chapters 8, 9]; TB3 [Chapter 8]
35.	Hamiltonian Circuit Problem, Subset-Sum Problem	
36.	Graph Coloring Problem. Branch and Bound: Assignment Problem, Travelling Salesman Problem	
37.	Introduction to Computability, Polynomial-time Verification	
38.	NP-Completeness. Complexity Classes: Reducibility	
39.	NP-Completeness Proof, NP-Complete & NP-Hard, Problem Classification-P, NP, NPC, NP-Hard	
40.	Circuit Satisfiability	
41.	3SAT, Vertex Cover	
42.	Clique, Cook's Theorem	

Course: MCA-261 – Design and Analysis of Algorithms Lab	
MCA – 2nd Semester	**No. of Practical Hours per Week: 02**

Course/Lab Outcomes (COs):

COs for Practical (MCA-261)	
CO1	Apply logical thinking to build solutions for given problems.. (BTL3)
CO2	Evaluate correctness & efficiency of algorithms using inductive proofs and invariants. (BTL5)
CO3	Design and perform parameter-based analysis of the searching, sorting and tree-based algorithms. (BTL6)
CO4	Create and test optimal solutions for various problems. (BTL6)

Lesson Plan for Practical:

Week No.	Lab No.	Topics/Concepts to be Covered	Reference of Lab Manual
1.	1.	Basics of Algorithms	P1-P4, P10
2.	2.	Divide and Conquer Paradigm	P4, P5, P14
3.	3.	Sorting	P6, P9
4.	4.	String Matching Concept	P7, P18, P19
5.	5.	Greedy Algorithms	P8
6.	6.	Dynamic Programming	P11
7.	7.	Backtracking	P12, P13
8.	8.	Travelling Salesman Problem	P17
9.	9.	Graph Coloring Problem	P15, P16
10.	10.	Dynamic Programming	P21
11.	11.	Dynamic Programming	P22
12.	12.	Revision of all concepts	-

Testing Schedule:

Nature of Test	February	March	April	May
Surprise Test (ST)	ST in 3rd week	ST in 2nd week	-	-
Mid Term Test (MT)	-		MT in 1st week	-
Class Test (CT)	CT in 4th week		-	-
Supplementary Test (Sp. T)	-	-	-	Sp. T in 3rd week
Assignment Submission Schedule	**Assignment-1** is to be submitted One Week after completion of Unit-1 and Unit-2. **Assignment-2** is to be submitted One Week after completion of Unit-3. **Assignment-3** is to be submitted One Week after completion of Unit-4.			