Course Code	18CSC204J	Course Name	DESIGN AND ANALYSIS OF ALGORITHMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	18CSC201J, 18CSC202J	Co-requisite Courses	18CSC207J	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1:	Design efficient algorithms in solving complex real time problems
CLR-2:	Analyze various algorithm design techniques to solve real time problems in polynomial time
CLR-3:	Utilize various approaches to solve greedy and dynamic algorithms
CLR-4:	Utilize back tracking and branch and bound paradigms to solve exponential time problems
CLR-5:	Analyze the need of approximation and randomization algorithms, utilize the importance Non polynomial algorithms
CLR-6:	Construct algorithms that are efficient in space and time complexities

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO–3
CLO-1:	Apply efficient algorithms to reduce space and time complexity of both recurrent and non-recurrent relations	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2:	Solve problems using divide and conquer approaches	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3:	Apply greedy and dynamic programming types techniques to solve polynomial time problems.	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4:	Create exponential problems using backtracking and branch and bound approaches.	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5:	Interpret various approximation algorithms and interpret solutions to evaluate P type, NP Type, NPC, NP Hard problems	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-6:	Create algorithms that are efficient in space and time complexities by using divide conquer, greedy, backtracking technique	3	80	70	L	H	M	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction-Algorithm Design*	*Introduction-Divide and Conquer*	*Introduction-Greedy and Dynamic Programming*	*Introduction to backtracking - branch and bound*	*Introduction to randomization and approximation algorithm*
	SLO-2	*Fundamentals of Algorithms*	*Maximum Subarray Problem*	*Examples of problems that can be solved by using greedy and dynamic approach*	*N queen's problem - backtracking*	*Randomized hiring problem*
S-2	SLO-1	*Correctness of algorithm*	*Binary Search*	*Huffman coding using greedy approach*	*Sum of subsets using backtracking*	*Randomized quick sort*
	SLO-2	*Time complexity analysis*	*Complexity of binary search*	*Comparison of brute force and Huffman method of encoding*	*Complexity calculation of sum of subsets*	*Complexity analysis*
S-3	SLO-1	*Insertion sort-Line count, Operation count*	*Merge sort*	*Knapsack problem using greedy approach*	*Graph introduction*	*String matching algorithm*
	SLO-2	*Algorithm Design paradigms*	*Time complexity analysis*	*Complexity derivation of knapsack using greedy*	*Hamiltonian circuit - backtracking*	*Examples*
S 4-5	SLO-1	*Lab 1: Simple Algorithm-Insertion sort*	*Lab 4: Quicksort, Binary search*	*Lab 7: Huffman coding, knapsack and using greedy*	*Lab 10: N queen's problem*	*Lab 13: Randomized quick sort*
	SLO-2					
S-6	SLO-1	*Designing an algorithm*	*Quick sort and its Time complexity analysis*	*Tree traversals*	*Branch and bound - Knapsack problem*	*Rabin Karp algorithm for string matching*
	SLO-2	*And its analysis-Best, Worst and Average case*	*Best case, Worst case, Average case analysis*	*Minimum spanning tree - greedy Kruskal's algorithm - greedy*	*Example and complexity calculation. Differentiate with dynamic and greedy*	*Example discussion*
S-7	SLO-1	*Asymptotic notations Based on growth functions.*	*Strassen's Matrix multiplication and its recurrence relation*	*Minimum spanning tree - Prims algorithm*	*Travelling salesman problem using branch and bound*	*Approximation algorithm*
	SLO-2	*O,O,Θ, ω, Ω*	*Time complexity analysis of Merge sort*	*Introduction to dynamic programming*	*Travelling salesman problem using branch and bound example*	*Vertex covering*
S-8	SLO-1	*Mathematical analysis*	*Largest sub-array sum*	*0/1 knapsack problem*	*Travelling salesman problem using branch and bound example*	*Introduction Complexity classes*
	SLO-2	*Induction, Recurrence relations*	*Time complexity analysis of Largest sub-array sum*	*Complexity calculation of knapsack problem*	*Time complexity calculation with an example*	*P type problems*
S 9-10	SLO-1	*Lab 2: Bubble Sort*	*Lab 5: Strassen Matrix multiplication*	*Lab 8: Various tree traversals, Krukshall's MST*	*Lab 11: Travelling salesman problem*	*Lab 14: String matching algorithms*
	SLO-2					
S-11	SLO-1	*Solution of recurrence relations*	*Master Theorem Proof*	*Matrix chain multiplication using dynamic programming*	*Graph algorithms*	*Introduction to NP type problems*
	SLO-2	*Substitution method*	*Master theorem examples*	*Complexity of matrix chain multiplication*	*Depth first search and Breadth first search*	*Hamiltonian cycle problem*
S-12	SLO-1	*Solution of recurrence relations*	*Finding Maximum and Minimum in an array*	*Longest common subsequence using dynamic programming*	*Shortest path introduction*	*NP complete problem introduction*
	SLO-2	*Recursion tree*	*Time complexity analysis-Examples*	*Explanation of LCS with an example*	*Floyd-Warshall Introduction*	*Satisfiability problem*
S-13	SLO-1	*Solution of recurrence relations*	*Algorithm for finding closest pair problem*	*Optimal binary search tree (OBST)using dynamic programming*	*Floyd-Warshall with sample graph*	*NP hard problems*
	SLO-2	*Examples*	*Convex Hull problem*	*Explanation of OBST with an example.*	*Floyd-Warshall complexity*	*Examples*

S 14 -1 5	SLO-1 SLO-2	*Lab 3: Recurrence Type-Merge sort, Linear search*	*Lab 6: Finding Maximum and Minimum in an array, Convex Hull problem*	*Lab 9: Longest common subsequence*	*Lab 12: BFS and DFS implementation with array*	*Lab 15: Discussion over analyzing a real time problem*

Learning Resources	1. *Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, Introduction to Algorithms, 3rd ed., The MIT Press Cambridge, 2014* 2. *Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson Education, 2006*	3. *Ellis Horowitz, Sartajsahni, Sanguthevar, Rajesekaran, Fundamentals of Computer Algorithms, Galgotia Publication, 2010* 4. *S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, 2015*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*\15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. G. Venkiteswaran, Wipro Technologies, gvenki@pilani.bits-pilani.ac.in	*1. MiteshKhapra, IITM Chennai, miteshk@cse.iitm.ac.in*	*1. Mr.K.Senthil Kumar, SRMIST*
2. Dr.SainarayananGopalakrishnan, HCL Technologies, sai.jgk@gmail.com	*2. V. Masilamani. IIITDM, masila@iiitdm.ac.in*	*2. Dr.A.Razia Sulthana, SRMIST*
		3. Mr. V. Sivakumar, SRMIST
		4. Ms. R. Vidhya, SRMIST