Course Code	18CSC201J	Course Name	DATA STRUCTURES AND ALGORITHMS	Course Category	C	*Professional Core*	L	T	P	C
							3	0	2	4

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*18CSC204J*
Course Offering Department	*Computer Science and Engineering*	**Data Book / Codes/Standards**	*Nil*		

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	**Learning**		
		1	2	3
CLR-1:	*Utilize the different data types; Utilize searching and sorting algorithms for data search*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-2:	*Utilize linked list in developing applications*			
CLR-3:	*Utilize stack and queues in processing data for real-time applications*			
CLR-4:	*Utilize tree data storage structure for real-time applications*			
CLR-5:	*Utilize algorithms to find shortest data search in graphs for real-time application development*			
CLR-6:	*Utilize the different types of data structures and its operations for real-time programming applications*			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*			
CLO-1:	*Identify linear and non-linear data structures. Create algorithms for searching and sorting*	*3*	*80*	*70*
CLO-2:	*Create the different types of linked lists and evaluate its operations*	*3*	*85*	*75*
CLO-3:	*Construct stack and queue data structures and evaluate its operations*	*3*	*75*	*70*
CLO-4:	*Create tree data structures and evaluate its types and operations*	*3*	*85*	*80*
CLO-5:	*Create graph data structure, evaluate its operations, implement algorithms to identify shortest path*	*3*	*85*	*75*

Program Learning Outcomes (PLO)															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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
L	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-
M	*H*	*L*	*M*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
M	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-
H	*H*	*M*	*H*	*L*	-	-	-	*M*	*L*	-	*H*	-	-	-

CLO-6 :	*Construct the different data structures and evaluate their types and operations*	*3*	*80*	*70*		*L*	*H*	-	*H*	*L*	-	-	-	*L*	*L*	-	*H*	-	-	-

Duration (hour)		**15**	**15**	**15**	**15**	**15**
S-1	SLO-1	*Introduction-Basic Terminology*	*Array*	*Stack ADT*	*General Trees*	*Graph Terminology*
	SLO-2	*Data Structures*	*Operations on Arrays – Insertion and Deletion*	*Stack Array Implementation*	*Tree Terminologies*	*Graph Traversal*
S-2	SLO-1	*Data Structure Operations*	*Applications on Arrays*	*Stack Linked List Implementation*	*Tree Representation*	*Topological sorting*
	SLO-2	*ADT*	*Multidimensional Arrays- Sparse Matrix*	*Applications of Stack- Infix to Postfix Conversion*	*Tree Traversal*	*Minimum spanning tree – Prims Algorithm*
S-3	SLO-1	*Algorithms – Searching techniques*	*Linked List Implementation - Insertion*	*Applications of Stack- Postfix Evaluation*	*Binary Tree Representation*	*Minimum Spanning Tree - Kruskal's Algorithm*
	SLO-2	*Complexity – Time , Space Trade off*	*Linked List- Deletion and Search*	*Applications of Stack- Balancing symbols*	*Expression Trees*	*Network flow problem*
S 4-5	SLO-1	*Lab 1: Implementation of Searching - Linear and Binary Search Techniques*	*Lab 4 :Implementation of Array – Insertion, Deletion.*	*Lab 7 :Implementation of stack using array and Linked List*	*Lab 10: Implementation of Tree using array*	*Lab 13: Implementation of Graph using Array*
	SLO-2					
S-6	SLO-1	*Algorithms - Sorting*	*Applications of Linked List*	*Applications of Stack- Nested Function Calls*	*Binary Tree Traversal*	*Shortest Path Algorithm- Introduction*
	SLO-2	*Complexity – Time , Space Trade off*	*Polynomial Arithmetic*	*Recursion concept using stack*	*Threaded Binary Tree*	*Shortest Path Algorithm: Dijkstra's Algorithm*
S-7	SLO-1	*Mathematical notations*	*Cursor Based Implementation – Methodology*	*Applications of Recursion:Tower of Hanoi*	*Binary Search Tree :Construction, Searching*	*Hashing: Hash functions – Introduction*
	SLO-2	*Asymptotic notations-Big O, Omega*	*Cursor Based Implementation*	*Queue ADT*	*Binary Search Tree : Insertion and Deletion*	*Hashing: Hash functions*
S-8	SLO-1	*Asymptotic notations - Theta*	*Circular Linked List*	*Queue Implementation using array*	*AVLTrees: Rotations*	*Hashing : Collision avoidance*
	SLO-2	*Mathematical functions*	*Circular Linked List - Implementation*	*Queue Implementation using Linked List*	*AVL Tree: Insertions*	*Hashing : Separate chaining*
S 9-10	SLO-1	*Lab 2: Implementation of sorting Techniques – Insertion sort and Bubble Sort Techniques*	*Lab 5: Implementation of Linked List - Cursor Based Implementation*	*Lab 8: Implementation of Queue using Array and linked list*	*Lab 11: Implementation of BST using linked list*	*Lab 14 :Implementation of Shortest path Algorithm*
	SLO-2					

S-1 1	SLO-1	*Data Structures and its Types*	*Applications of Circular List -Joseph Problem*	*Circular Queue*	*B-Trees Constructions*	*Open Addressing*
	SLO-2	*Linear and Non-Linear Data Structures*	*Doubly Linked List*	*Implementation of Circular Queue*	*B-Trees Search*	*Linear Probing*
S-1 2	SLO-1	*1D, 2D Array Initialization using Pointers*	*Doubly Linked List Insertion*	*Applications of Queue*	*B-Trees Deletions*	*Quadratic probing*
	SLO-2	*1D, 2D Array Accessing usingPointers*	*Doubly Linked List Insertion variations*	*Double ended queue*	*Splay Trees*	*Double Hashing*
S-1 3	SLO-1	*Declaring Structure and accessing*	*Doubly Linked List Deletion*	*Priority Queue*	*Red Black Trees*	*Rehashing*
	SLO-2	*Declaring Arrays of Structures and accessing*	*Doubly Linked List Search*	*Priority Queue - Applications*	*Red Black Trees Insertion*	*Extensible Hashing*
S 14-15	SLO-1	*Lab 3: Implement Structures using Pointers*	*Lab 6: Implementation of Doubly linked List*	*Lab 9: Applications of Stack, Queue*	*Lab 12:Implementation of B-Trees*	*Lab 15 :Implementation of Minimal Spanning Tree*
	SLO-2					

Learning Resources	1. *Seymour Lipschutz, Data Structures with C, McGraw Hill, 2014* 2. *R.F.Gilberg, B.A.Forouzan, Data Structures, 2nd ed., Thomson India, 2005* 3. *A.V.Aho, J.E Hopcroft , J.D.Ullman, Data structures and Algorithms, Pearson Education, 2003* 4. *Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd ed., Pearson Education, 2015*	5. *Reema Thareja, Data Structures Using C, 1st ed., Oxford Higher Education, 2011* 6. *Thomas H Cormen, Charles E Leiserson, Ronald L Revest, Clifford Stein, Introduction to Algorithms 3rd ed., The MIT Press Cambridge, 2014*

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	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Understand										
Level 2	Apply	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Analyze										
Level 3	Evaluate	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Create										
	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		
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