Course Code	USA20202J	Course Name	DATA STRUCTURES AND ALGORITHMS	Course Category	C	Professional Core Course	L	T	P	C
							4	0	2	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	Utilize the different data types; Utilize searching and sorting algorithms
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:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Identify linear and non-linear data structures. Create algorithms for searching and sorting	2	80	70
CLO-2 :	Create the different types of linked lists and evaluate its operations	2	85	75
CLO-3 :	Construct stack and queue data structures and evaluate its operations	2	75	70
CLO-4 :	Create tree data structures and evaluate its types and operations	2	85	80
CLO-5 :	Create graph data structure, evaluate its operations, implement algorithms to identify shortest path	2	85	75
CLO-6 :	Construct the different data structures and evaluate their types and operations	2	80	70

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
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	-	-	-
L	H	-	H	L	-	-	-	L	L	-	H	-	-	-

Duration (hour)		18	18	18	18	18
S-1	SLO-1	Introduction to theory of data structures	Introduction to stack	Tree Traversals – Inorder, preorder	Introduction to sorting	Graph Terminology
	SLO-2	Data representation	Representation of stack through array	Tree Traversals - Postorder	Efficiency of algorithm	Representation of graph – Arrays
S-2	SLO-1	Abstract Data type	Representation of stack through linked list	Binary Search Tree	Time complexity and space complexity	Representation of graph – Linked list
	SLO-2	Classification of data types	Operations on stack	Threaded Binary Search Tree	Different types of sorting	Graph Traversal – BFS
S-3	SLO-1	Program design and algorithm	Disadvantages of Stack, Polish notations	Binary Search Tree :Construction	Bubble sort	Example
	SLO-2	Problem Solving using algorithm	Applications – Evaluation of expression	Binary Search Tree : Insertion	Example	Graph Traversal – DFS
S-4	SLO-1	Recursion	Infix to Postfix expression	Binary Search Tree : Searchimg	Insertion Sort	Example
	SLO-2	Example	Tower of Hanoi, Recursion	Example	Example	Topological Sorting
S 5-6	SLO-1	Lab 1: Recursion	Lab 4 : stack and its applications	Lab 7 : Tree Traversals	Lab 10 : Implementation of Bubble and Insertion sort	Lab 13: Implementation of Graph using Array
	SLO-2					
S-7	SLO-1	Asymptotic Notation	Queue	Applications of trees	Selection sort	Shortest Path Algorithm- Introduction
	SLO-2	Algorithm Analysis	Representation of Queue using Arrays and Linked list	Applications of BST	Example	Shortest Path Algorithm: Dijkstra

S-8	SLO-1	Introduction to Data structures	Operations on Queue	Expression trees	Comparison of sorts	Minimum spanning tree – Prims
	SLO-2	Data Structures and its uses	Circular Queue	Example	Quick sort	Example
S-9	SLO-1	Linear and Non Linear Data Structures	Double ended Queue	AVL Tree	Example	Minimum Spanning Tree – Kruskals
	SLO-2	Operations on data structure	Priority Queue	AVL Tree Rotations	Merge sort	Example
S-10	SLO-1	Arrays and Pointers	Reversing a Queue using another queue	Example	Example	Network flow problem
	SLO-2	Structure and Pointers	Applications of Queue	Applications of AVL tree	Radix sort	Applications of Graph
S 11-12	SLO-1	Lab 2: Arrays, structure using pointers	Lab 5: Queue implementation using array and pointers	Lab 8: Implementation of BST	Lab 11 : Implementation of Qucik sort and merge sort	Lab 14 : Implementation of shortest path algorithm
	SLO-2					
S-13	SLO-1	Array types	Introduction to non linear data structures	Heap Data Structure	Shell sort	Define Hashing
	SLO-2	Array operations	Tree ADT and Terminologies	Minimum Heap Construction	Example	Hashing: Hash functions
S-14	SLO-1	Dynamic memory allocation	Tree Terminologies	Minimum Heap Deletion Construction	Heap Sort	Hashing : Collision avoidance
	SLO-2	Introduction to lists	Tree Representation	Example	Example	Hashing : Separate chaining
S-15	SLO-1	Linked list operations	Tree Types and Operations	Maximum Heap Construction	Linear search	Example
	SLO-2	Types of Linked Lists	Binary Tree Representation	Maximum Heap Deletion Construction	Binary search	Open addressing
S-16	SLO-1	Linked list vs. Arrays	Properties of binary tree	Example	Comparison of different search	Example
	SLO-2	Application of linked list		Applications of Heaps and AVL trees	Example	Advantages of Hashing
S 17-18	SLO-1	Lab 3 : Linked List	Lab 6: Implementation of binary tree using Arrays	Lab 9 :Heap Implementation	Lab 12: Linear search and Binary search	Lab 15 : Implementation of minimum spanning tree
	SLO-2					

Learning Resources	1. Seymour Lipschutz, (2014), "Data Structures with C", McGraw Hill Education, Special Indian Edition 2. SRD Group, (2013), "Data structures using C",McGraw Hill, 2nd Edition, 3. R.F.Gilberg, B.A.Forouzan, (2005), "Data Structures", Thomson Indi, 2nd Edition, 4. A.V.Aho, J.E Hopcroft , J.D.Ullman, (2003), "Data structures and Algorithms", 1st Edition, Pearson Education	5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education 6. ReemaThareja, (2011), "Data Structures Using C", 1st Edition, Oxford Higher Education

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		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 %		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**
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	Mr. D.Bakthavachalam, SRMIST
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		Dr.S.Sabeen, SRMIST