15CS201J	Data Structures	L	T	P	C
		3	0	2	4
Co-requisite:	Nil				
Prerequisite:	Nil				
Data Book / Codes/Standards	Nil				
Course Category	P Professional Core				
Course designed by	Department of Computer Science and Engineering				
Approval	32nd Academic Council Meeting , 23rd July 2016				

PURPOSE	Data structure is a particular way of storing and organizing information in a computer so that it can be better processed. This course introduces different kind of data structures like stack, queue, linked list, tree and graph suitable for different kinds of applications. Specific data structures are most important for many efficient algorithms.

INSTRUCTIONAL OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand analysis of algorithm and its time complexity	a	b					
2.	Be familiar with and implement the Linked list data structure	a	b	c				
3.	Be familiar with and implement the Stack and Queue data structure	a	b	c				
4.	Have a comprehensive knowledge of Trees and their implementations	a	b	c				
5.	Learn advanced data structures like Graphs and their implementation, hash tables and Hashing methods	a	b	c				

Session	**Description of Topic**	**Contact hours**	**C-D-I-O**	**IOs**	**Reference**
UNIT I: INTRODUCTION TO DATA STRUCTURES		**6**			
1.	Introduction : Basic terminology - Data structures – Data structure operations	1	C	1	1
2.	ADT – Algorithms: Complexity, Time – Space trade off	1	C	1	1
3.	Mathematical notations and functions	1	C	1	1
4.	Asymptotic notations – Linear and Binary search	1	C,I	1	1
5.	Asymptotic notations – Bubble sort	1	C,I	1	1
6.	Asymptotic notations -Insertion sort	1	C,I	1	1
UNIT II: ARRAYS AND LIST		**9**			
7.	Array : Operations on Arrays, Applications of Arrays	1	C,I	2	1,2,3
8.	Multidimensional Arrays : Sparse Matrix	2	C	2	1,2,3
9.	Linked List : Insertion, Deletion and Search, Cursor based implementation	2	C,I	2	1,2
10.	Polynomial Arithmetic	1	C,I	2	1,2
11.	Circular Linked List – Applications – Josephus Problem	1	C, I	2	1,2
12.	Doubly linked list: Insertion, Deletion and Search	2	C,I	2	1,2
UNIT III: STACK AND QUEUE		**9**			
13.	Stack: Array implementation, Linked list implementation	1	C	3	1,2
14.	Applications of Stack – Infix to Postfix – Evaluation of Postfix	2	C,I	3	1,2
15.	Application of Stack – Balancing symbols – Nested function calls	1	C,I	3	1,2
16.	Recursion – Towers of Hanoi	1	C,I	3	1,2
17.	Queue – Array implementation , Linked List implementation	1	C,I	3	1,2
18.	Circular Queue	1	C	3	1,2
19.	Applications of Queue – Priority queue – Double ended queue	2	C	3	1
UNIT IV: TREES		**11**			
20.	General trees – Terminology – Representation of trees – Tree traversal	1	C,D,I	4	1,2
21.	Binary tree – Representation – Expression tree – Binary tree traversal, Threaded Binary Tree	1	C,D,I	4	1,2

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
22.	Binary Search Tree – Construction - Searching , Deletion	2	C,D,I	4	1,2
23.	AVL trees – Rotation, Insertion	2	C,D,I	4	1,2
24.	B-Trees, construction, searching, deletion	2	C,D,I	4	1,2
25.	Splay trees	1	C	4	1,2
26.	Red-Black Trees	2	C	4	1,2
UNIT V: GRAPHS AND HASH TABLES		**10**			
27.	Graph Terminology, Graph Traversal, Topological sorting	1	C,D,I	5	1,2,4
28.	Minimum spanning tree – Prims - Kruskals	2	C,D,I	5	1,2,3
29.	Network flow problem	1	C	5	1,2,4
30.	Shortest Path Algorithm: Dijkstra	2	C,D,I	5	1,2,3
31.	Graph Search: Depth First Search, Breadth First Search	1	C,D,I	5	1,2
32.	Hashing: Hash functions, Collision avoidance, Separate chaining	1	C,D,I	5	1,2
33.	Open addressing: Linear probing, Quadratic Probing, Double hashing, Rehashing, Extensible Hashing	2	C	5	1,2
	Total contact hours	**45***			

Session	Description of the Experiments	Contact hours	C-D-I-O	IOs	Reference
1.	Implementation of Sorting, searching	4	D,I	1	1,2,3,4,5
2.	Implementation of Linked List (Singly , Doubly, Circular)	4	D,I	2	1,2,3,4,5
3.	Implementation of stack using array, linked list	4	D,I	2	1,2,3,4,5
4.	Implementation of queue using array, linked list	4	D,I	2	1,2,3,4,5
5.	Applications of stack, queue	4	D,I	3	1,2,3,4,5
6.	Binary Tree Traversal , Binary Search Tree Implementation	4	D,I	4	1,2,3,4,5
7.	Minimum Spanning Tree	4	D,I	5	1,2,3,4,5
8.	Shortest path algorithm using Dijkstra	3	D,I	5	1,2,3,4,5
	Total Contact Hours	30*			

LEARNING RESOURCES	
Sl. No.	**TEXT BOOKS**
1.	Seymour Lipschutz, “Data Structures with C”, McGraw Hill Education, Special Indian Edition, 2014.
2.	R.F.Gilberg, B.A.Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.
	REFERENCE BOOKS/OTHER READING MATERIAL
3.	A.V.Aho, J.E Hopcroft and J.D.Ullman, “Data structures and Algorithms”, Pearson Education, First Edition Reprint 2003.
4.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,
5.	ReemaThareja, “Data Structures Using C”, Oxford Higher Education , First Edition, 2011

Course nature		**Theory + Practical**					
Assessment Method – Theory Component (Weightage 50%)							
In-semester	**Assessment tool**	Cycle test I	Cycle test II	Cycle Test III	Surprise Test	Quiz	**Total**
	Weightage	**10%**	**15%**	**15%**	**5%**	**5%**	**50%**
End semester examination Weightage :							**50%**
Assessment Method – Practical Component (Weightage 50%)							
In-semester	**Assessment tool**	Experiments	Record	MCQ/Quiz/Viva Voce	Model examination		**Total**
	Weightage	**40%**	**5%**	**5%**	**10%**		**60%**
End semester examination Weightage :							**40%**

* Excluding Assessment Hours