SEMESTER-1

Course Code	PCS21C01J	Course Name	ADVANCED DATA STRUCTURES	Course Category	C	Professional Core Course	L	T	P	C
							3	0	4	5

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

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	*Discuss the computational efficiency of the sorting and searching algorithms.*
CLR-2 :	*Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory.*
CLR-3 :	*Implementation of Trees and Graphs and perform various operations on these data structure.*
CLR-4 :	*Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.*
CLR-5 :	*Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.*
CLR-6 :	*Utilize algorithms to find shortest data search in graphs for real-time application development.*

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 (%)	Disciplinary Knowledge	Critical Thinking	Problem Solving	Analytical Reasoning	Research Skills	Team Work	Scientific Reasoning	Reflective Thinking	Self-Directed Learning	Multicultural Competence	Ethical Reasoning	Community Engagement	PSO 1	PSO 2	PSO 3
CLO-1 :	*Identify linear and non-linear data structures. Create algorithms for searching and sorting.*	3	80	70	L	H	-	H	L								-	-	-
CLO-2 :	*To improve the problem solving quality using data structure techniques.*	3	85	75	M	H	L	M	L								-	-	-
CLO-3 :	*Create the different types of linked lists and evaluate its operations.*	3	75	70	M	H	M	H	L								-	-	-
CLO-4 :	*Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory,used by the algorithms and their common applications.*	3	85	80	M	H	M	H	L								-	-	-
CLO-5 :	*Construct the different data structures and evaluate their types and operations.*	3	85	75	H	H	M	H	L								-	-	-
CLO-6 :	*Create graph data structure, evaluate its operations, implement algorithms to identify shortest path*	3	85	80	M	H	M	H	L								-	-	-

Duration(Hour)		21	21	21	21	21
S-1	SLO-1	*Linear Data Structures*	*Tree Structures*	*Introduction to Tree Search*	*Introduction to Graphs*	*Algorithms*
	SLO-2	*Introduction to Data Structure*	*Introduction to Tree Structure*	*Balanced Search Trees*	*Objective of Graphs*	*Introduction to Algorithms*
S-2	SLO-1	*Algorithm Analysis*	*Non-Linear Structures*	*Sorting*	*Definitions of Graphs*	*Divide and conquer*
	SLO-2	*Asymptotic Notations*	*Need for Non-Linear Structures*	*Indexing*	*Representation of Graph*	*Objective of Divide and conquer algorithm*
S-3	SLO-1	*Introduction ADT*	*Trees*	*Introduction to AVL*	*Graph Traversals*	*Binary Search*
	SLO-2	*Abstract Data Types (ADT)*	*Tree Representation*	*AVL Trees*	*Applications of Graphs*	*Greedy algorithm*
S-4 to S-7	SLO-1	*Laboratory 1: Recursion*	*Laboratory 4 : stack and its applications*	*Laboratory 7 : Tree Traversals*	*Laboratory 10 : Implementation of Bubble and Insertion sort*	*Laboratory 13: Implementation of Graph using Array*
S-8	SLO-1	*ADT Objectives*	*Binary Tree*	*B-Trees*	*Sorting*	*Knapsack Problem*
	SLO-2	*The Arrays*	*Tree Traversals*	*Sorting*	*Topological Sort*	*Dynamic Programming*
S-9	SLO-1	*The Stack*	*Expression Trees*	*Bubble sort*	*Shortest path algorithms*	*Merits of Dynamic programming*
	SLO-2	*Queue*	*Binary tree traversals*	*Quick Sort*	*Spanning Tree*	*Multistage Graph*
S-10	SLO-1	*Circular Queue*	*General Trees*	*Insertion Sort*	*Minimum Cost Spanning Tree*	*Backtracking*
	SLO-2	*Applications of Stack*	*Data Structure for General trees*	*Heap sort*	*Advantages of Minimum cost Spanning tree*	*Objective of Backtracking*

Duration(Hour)		21	21	21	21	21
S-11 to S-14	SLO-1	*Laboratory 2: Arrays, structure using pointers*	*Laboratory 5: Queue implementation using array and pointers*	*Laboratory 8: Implementation of BST*	*Laboratory 11 : Implementation of Qucik sort and merge sort*	*Laboratory 14 : Implementation of shortest path algorithm*
S-15	SLO-1	*Application of Queue*	*Applications of trees*	*Hashing*	*Prim's Algorithm*	*Sum of Subset*
	SLO-2	*Infix to Postfix conversion*	*Algorithm*	*Hashing Function*	*Representation of Prim's Algorithm*	*Sum of Subset Problem*
S-16	SLO-1	*Evaluation of Expression*	*Types of Algorithm*	*Collision Resolution Techniques*	*Kruskal's Algorithm*	*Branch And Bound Problem*
	SLO-2	*Linked Lists*	*Objective of Binary tree*	*Separation Chaining*	*Merits of Kruskal's Algorithm*	*Branch and Bound Representation*
S-17	SLO-1	*Doubly Linked List*	*Huffman Algorithm*	*Open Addressing*	*Demerits of Kruskal's Algorithm*	*Travelling Salesman problem*
	SLO-2	*Application of linked list*	*Binary Search tree.*	*Multiple hashing*	*Kruskal's Algorithm Representation*	*Travelling Salesman problem Representation*
S-18 to S-21	SLO-1	*Laboratory 3 : Linked List*	*Laboratory 6: Implementation of binary tree using Arrays*	*Laboratory 9 :Heap Implementation*	*Laboratory 12: Linear search and Binary search*	*Laboratory 15 : Implementation of minimum spanning tree*

Learning Resources	1. Anany Levitin (2011), "Introduction to the Design and Analysis of Algorithms", Addison Wesley Professional. (Unit I).	2. Seymore Litschutz,Schaum Outline ,"Data Structures", Adapted by G.A.V PAI, McGrawHill. (For Units II to V).

Learning Assessment

Bloom's Level of Thinking		Continous 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, Scientific Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications etc.,

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr. S. Karthik, Assistant Consultant, Tata Consultancy Services	Dr. S. Sasikala, Associate Professor and Head, Dept. of Computer Science, University of Madras	Dr. S. Kanchana
		Mr. Ramesh