Course Code	Course Title	L	T	P	C
PMDS605L	Data Structure and Algorithms	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. To provide knowledge on various data structures and its real time applications
2. To familiar in design and performance evaluation of data structure and algorithms
3. To familiar in advanced techniques with industrial development

Course Outcomes

At the end of the course, the students will be able to:

1. Understand the foundation of data structure, compute the complexity and notations, design and implement Array ADT.
2. Identify suitable algorithm for the abstract data structure Stack, Queue and List.
3. Classify various Tree data structures and its applications.
4. Select the suitable algorithm for Sorting and Searching.
5. Develop suitable data structure for Graph and its Applications.

Module:1	Foundation of Data Structure	7 hours

Importance of Data Structure - Asymptotic Notations (Big O, Small O, Theta, Omega) Performance of Algorithm and Analysis - Time and Space Complexity - ADT- Arrays: One dimension and Two dimension, Structure and Union - Pointers, Storage Allocation: Static and Dynamic Allocation

Module:2	Stacks and Queue	6 hours

Stack: Definition, Operations, Implementations, Applications: Recursion, Infix to Postfix and Evaluation of Postfix, Queue: Definition, Operations, Implementations, Applications: Circular Queue - Multiple Stack and Queues.

Module:3	Lists	6 hours

Linked List: Definition, Operations (INSERT, DELETE, TRAVERSE- DISPLAY) – Implementation: Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists- Application : Polynomial Addition using Linked List

Module:4	Trees	6 hours

Definition, Terminology, Binary Tree: Binary Tree Representation, Binary Search Tree, Binary Tree Traversal: In order, Pre order, Post Order and Level order traversal. Heap Data Structure- Min Heap and Max Heap Tree construction.

Module:5	Advanced Trees	6 hours

Balanced Trees - AVL trees: Terminology, basic operations (rotation, insertion and deletion), 2-3 Trees, 2-3-4 Trees, B Trees, B+ Trees

Module:6	Graphs	6 hours

Graph ADT, Elementary Graph Operation, Minimum cost spanning tree Algorithms, Shortest Path -Single Source and All Pair Algorithms.

Module:7	Search and Sort	6 hours

Search - Linear and Binary Search - Applications; Sorting: Bubble Sort, Insertion Sort, Selection Sort Quick, Merge Sort and Heap Sort.

Module:8	Contemporary Issues	2 hours
	Total Lecture hours	**45 hours**

	Text Book(s)	
1	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest and Clifford Stein, Introduction to Algorithms, 2022, 4th Edition, Mcgraw Hill/ MIT Press.	
2	Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, 2015, 2nd Edition, Pearson.	
Reference Book(s)		
1	Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2008, 2nd Edition, University Press.	
2	R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, Introduction to the Design and Analysis of Algorithms, 2012, Tata McGraw-Hill.	
3	Ellis Horowitz and Sartaj Sahni, Fundamental of Computer Algorithms, 1985, Galgotia.	
4	Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 2010, 3rd Edition, Prentice Hall.	
Mode of Evaluation: CAT, Assignment, Quiz and FAT		
Recommended by Board of Studies	15-02-2024	
Approved by Academic Council	No. 73	Date |14-03-2024