Semester: 3rd			
Paper code: AIDS201/AIML201/IOT201	**L**	**T/P**	**Credits**
Subject: Data Structures	**3**	**0**	**3**
Marking Scheme			

1. Teachers Continuous Evaluation: As per university examination norms from time to time
2. End term Theory Examination: As per university examination norms from time to time

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per university norms

1. There should be 9 questions in the end term examination question paper.
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.
3. Apart from Question No. 1, the rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, students may be asked to attempt only 1 question from each unit.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required.

Course Objectives:	
1.	To understand the basic concepts of data structures.
2.	To perform basic operations on linked list, stacks and queues.
3.	To perform sorting and searching on a given set of data items.
4.	To understand the concepts of trees, hashing, and graph theory.

Course Outcomes:	
CO1	Understand and identify the concepts of fundamentals of data structures and efficient access strategies for solving a computational problem.
CO2	Apply suitable data structure for solving a given problem and differentiate the usage of data structures and their applications.
CO3	Analyse the choice of data structures and their usage for sorting and searching numbers in data structures.
CO4	Create the solution for a particular problem and gain ability to provide solutions/approaches with file handling and tree structures.

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	1	1	1	1	2
CO2	2	2	2	2	1	1	1	1	1	1	1	2
CO3	2	2	2	2	1	-	-	-	-	-	1	2
CO4	2	2	2	2	1	1	-	-	-	-	1	2

Course Overview:
This subject gives an overview of data structure concepts including arrays, stack, queues, linked lists, trees, and graphs. Discussions shall be held of various implementations of these data structures in real life. This subject also examines algorithms for sorting and searching. The concepts of trees and graph-based algorithms shall be introduced.

UNIT I: **[8]**
Introduction- Introduction to Algorithmic Complexity, Introduction to various data structures, Arrays and Strings operations, Stacks and Queues, Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks- Recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues, Overview of the list, set, tuples, and dictionary data structures.

UNIT II: **[8]**
Searching and Sorting- Linear Search, Binary search, Insertion Sort, Quick sort, Radix sort, Merge sort, Heap sort. Linked Lists- Singly linked lists, Representation of linked list, Operations of the Linked list such as Traversing, Insertion, and Deletion, Searching, and applications of Linked List. Concepts of Circular linked list and doubly linked list and their applications. Stacks and Queues as a linked list.

UNIT III: **[8]**
Trees- Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees, 2-3 trees, 2-3-4 trees, B* and B+ trees.

UNIT IV: **[8]**
File Structure- File Organization, Indexing & Hashing, Hash Functions, Graphs-Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Euler and Hamiltonian paths, Spanning trees, shortest path and Transitive Closure, Topological Sort, and Critical Paths.

Text Books:
1. Tannenbaum. Data Structures, PHI, 2007 (Fifth Impression).
2. An introduction to data structures and application by Jean-Paul Tremblay & Pal G. Sorenson (McGraw Hill).

Reference Books:
1. Data Structures with C - By Schaum Series.
2. R.L. Kruse, B.P. Leary, C.L. Tondo. Data structure and program design in C, PHI, 2009 (Fourth Impression).
3. Gilberg, R. F., & Forouzan, B. A., Data structures: A pseudocode approach with C++. Brooks/Cole Publishing, 2001.