Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
MCA23	Data Structures	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weight age)		

Pre-requisite Course Codes	Object Oriented Programming Concepts (MCA11)	
Course Outcomes	CO1	Compare Efficiency of various sorting algorithms.
	CO2	Make use of searching and hashing techniques for efficient data retrieval and data mapping.
	CO3	Apply various operations of Linear data structures to solve problems from different domains.
	CO4	Apply creative thinking to solve problems from different domains using Nonlinear data structures.

Module	Unit No.	Topics	Ref.	Hrs.
1		**Introduction**	1,2,3	3
	1.1	Introduction to Data Structures		
	1.2	Types of Data Structures		
	1.3	ADT (Abstract Data type)		
	1.4	Introduction to Time complexity and Space complexity		
	1.5	Asymptotic notations (Big O, Omega, Theta)		
2		**Sorting Techniques**	1,2,3	5
	2.1	Internal Sorting Techniques (Bubble sort, Insertion sort, Selection Sort, Radix Sort, Quick sort, Heap Sort)		
	2.2	External Sorting Techniques (Merge Sort)		
	2.3	Complexity calculation of Sorting Techniques using Asymptotic notations		
3		**Searching and Hashing Techniques**	1,2,3	5
	3.1	Sequential search, Binary search, Interpolation Search		
	3.2	Hashing Techniques (Direct, Subtraction, Modulo Division, Mid square, Digit Extraction, Folding, Double hashing)		
	3.3	Collision resolution techniques (Linear probe, Quadratic probe, Key offset, Chaining)		
4		**Linked list**	1,2,3	8
	4.1	Linked List as an ADT, Linked List Vs. Arrays		
	4.2	Types of Linked List: Singly, Doubly, Circular		
	4.3	Operations of Linked List (Insert, delete, traverse, count, search)		
	4.4	Application of Linked List: Polynomial addition and Subtraction,		

		Sparse Matrix.			
5		**Stack**		**1,2,3**	**5**
	5.1	The Stack as an ADT, Stack operations			
	5.2	Array Representation of Stack , Linked list Representation of Stack			
	5.3	Application of stack – Evaluation of Postfix expression, Balancing of Parenthesis, Recursion, Polish Notation			
6		**Queue**		**1,2**	**7**
	6.1	The Queue as an ADT, Queue operations			
	6.2	Array Representation of Queue, Linked Representation of Queue			
	6.3	Circular Queue			
	6.4	Priority Queue			
	6.5	Doubly Ended Queue			
	6.6	Application of Queues – Johnson's Algorithm , Round Robin CPU Scheduling Algorithm			
7		**Tree**		**1,3**	**7**
	7.1	Tree Definition and Terminologies			
	7.2	Binary Tree, Representation and traversal techniques			
	7.3	Binary Search Tree- Definition, Operations			
	7.4	Threaded Binary tree, Expression tree and Huffman tree			
	7.5	AVL tree- Definition, AVL tree rotation with examples			
	7.6	M way Tree- Introduction, B tree-definition and examples			
	7.7	Heaps-Definition, Operations			
	7.8	Application of Trees: Manipulation of Arithmetic expressions, Syntax Analysis			
8		**Graph**		**1,2,3**	**2**
	8.1	Graph Definition, Terminologies and Operations			
	8.2	Graph Representation			
	8.3	Applications of Graph -- DFS and BFS			
				Total	**42**

References:

[1] Richard F Gilberg, Behrouz A Forouzan, "Data Structure A Pseudocode Approach with C",Brooks/Cole Publishing Company, Second edition.

[2] Moshe, Tenenbaum, "Data Structures Using C and C, Pearson Education Asia Pvt. Ltd.", Second edition.

[3] Tremblay, Jean-Paul & Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, Second edition.