Course Code	Name of the Course
216U01C302	**Data Structures**

Teaching Scheme	TH	P	TUT	Total
(Hrs./Week)	03	-	-	03
Credits Assigned	03	-	-	03

Evaluation Scheme	Marks				
	LAB/TUT	CA (TH)		ESE	Total
	CA	IA	ISE		
	-	20	30	50	100

Course pre-requisites:
- Programming Language

Course Objectives:
The objective of this course is to introduce different types of data structure and how user can use data structure in software development. The course also familiarizes students with the concepts of advanced data structures such as balanced search trees, hash tables, priority queues, sorting and searching. Students will be master in the implementation of linked data structures such as linked lists and binary trees using any preferable language. Course mainly focuses on choosing the appropriate data structure for a specified application.

Course Outcomes (CO):
At the end of successful completion of the course the student will be able to

CO 1	Comprehend the different data structures used in problem solving
CO 2	Apply linear and non-linear data structure in application development.
CO 3	Describe concepts of advance data structures like set, map & dictionary.
CO 4	Demonstrate sorting and searching methods.

Detailed Curriculum

Module No.	Unit No.	Contents	No of Hrs.	CO
1		**Introduction to Data Structures**		
	1.1	Defining Data structure, Types of Data Structures, Abstract Data Type (ADT), Static and Dynamic Implementations Introduction to space and time complexity, O notation	05	CO1
	1.2	Applications of data structures.		
2		**Linear data structures: Linked List, Stack and Queue**		
	2.1	Introduction and Representation of Linked List, Linked List v/s Array, Implementation of Linked List, Circular Linked List, Doubly Linked List, Application – Polynomial Representation and Addition, Other additional applications/Case study.		
		#Self-learning - Sparse matrix addition		
	2.2	The Stack as an ADT, Stack operations, Array Representation of Stack, Linked Representation of Stack, Application of stack – Polish Notation, Recursion and other applications/Case study, **Application of stack in conversion and evaluation of postfix and prefix expression.**	16	CO2
	2.3	The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, and Double ended queue, Application of Queues – Simulation and other applications/Case study, **Application of queue in Josephus's Problem.**		
3		**Non-linear data structures: Tree and Graph**		
	3.1	Basic tree terminologies, Types of trees, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Threaded binary trees. Different Search Trees -AVL tree, Overview-Trie, Suffix tree, Applications/Case study of trees.		
		#Self-learning Learning – Red-Black and Splay Trees, Multiway Search Tree, #B Tree, #B+ Tree (# Also covered in DBMS in sem IV)	12	CO2
	3.2	Introduction to graph as a data structure, Terminologies, Representation, Traversals – Depth First Search (DFS) and Breadth First Search (BFS). Applications/Case study of Graphs.		
4		**Set, Map and Dictionary**		
	4.1	Set ADT, Set Implementation, and Partitions with Union-Find operations, Tree based partition implementation.		
	4.2	Map ADT, Implementation, Hash Tables Application of Maps	07	CO3
#Self-earning - *Dictionary ADT, Implementation, Application of Dictionaries, Exploring case studies on use of set, map and dictionary				

Module No.	Unit No.	Contents	No of Hrs.	CO
		(*Covered in python programming course in sem I)		
5		**Searching and Sorting**		
	5.1	Sort Concept: Sort Stability, in place sort, number of passes, Bubble Sort, Shell sort		
		#Self-learning - Bucket and Radix sort	05	CO4
	5.2	Search concept: Linear Search, Binary Search, Hashing, collision resolution: Separate chaining, Linear probing, quadratic probing, double hashing		
		Total	45	--

 # Self-learning topics will be evaluated through IA and/or Lab.

Reference Books*

Sr. No	Name/s of Author/s	Title of Book	Publisher	Edition/ Year
1	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed	*Fundamentals Of Data Structures In C*	University Press	Second Edition 2008
2	Michael T Goodrich Roberto Tamassia David Mount	*Data Structure and Algorithm in C++*	Wiley	Second Edition 2011
3	Richard F. Gilberg & Behrouz A. Forouzan	*Data Structures A Pseudocode Approach with C*	CENGAGE Learning	Second Edition 2005
4	Aaron M Tanenbaum Yedidyah Langsam Moshe J Augentstein	*Data structure Using C*	Pearson	Twelfth Impression 2013
5	Jean Paul Tremblay, Paul G. Sorenson	*An introduction to data structures with applications*	Tata McGraw-Hill Education	Second Edition 1984
6	Reema Thareja	*Data structures using C*	Oxford Higher Education	Second edition, 2014

*In addition to printed books, faculty can suggest (authentic) urls or e-books, e-contents etc.