Course Code: CSE-S208   **Breakup: 3 – 0 – 3 – 5**
Course Name: Data Structure Using Python

Course outcomes (CO): At the end of the course, the student will be able to:

CO1	Differentiate static and dynamic memory allocation techniques
CO2	Implement various operations on linear and non-linear data structures
CO3	Analyze and implement different searching and sorting techniques
CO4	Identity the appropriate data structure to solve a given problem
CO5	Compute time complexities of different algorithms

Course Details:
Informal introduction to programmin, algorithms and data structures viagcd, Downloading and installing Python, gcd in Python: variables, operations, control flow - assignments, condition-als, loops, functions, Python: types, expressions, strings, lists, tuples, Python memory model: names, mutable and immutable values, List operations: slices etc Binary search, Inductive function denitions: numerical and structural induction, Elementary inductive sorting: selection and insertion sort, In-place sorting

Basic algorithmic analysis: input size, asymptotic complexity, O() notation, Arrays vs lists, Merge sort, Quicksort, Stable sorting, Dictionaries, More on Python functions: optional arguments, default values, Passing functions as arguments, Higher order functions on lists: map, lter, list comprehension

Exception handling, Basic input/output, Handling files, String processing, Backtracking: N Queens, recording all solutions, Scope in Python: local, global, nonlocal names, Nested functions, Data structures: stack, queue, Heaps.

Abstract datatypes, Classes and objects in Python, "Linked" lists: find, insert, delete, Binary search trees: find, insert, delete, Height-balanced binary search trees, Effcient evaluation of recursive denitions: memorization, Dynamic programming: examples, Other programming languages: C and manual memory management, Other programming paradigms: functional programming

Text and Reference Books:
1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Anurag Gupta, G.P. Biswas, "Python Programming: Problem Solving, Packages and Libraries", McGrawHill, 2020.
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Shroff/O'Reilly; Second edition, 2016
4. Updated for Python 3, Shroff/O'Reilly Publishers, 2016
5. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
6. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
7. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016

Data Structures Lab

Write Program in Python for following:
1. Array implementation of Stack, Queue, Circular Queue
2. Linked list implementation using Dynamic memory Allocation, deletions and insertions, Linked Implementation of Stack, Queue, Circular Queue
3. Implementation of Tree Structures, Binary Tree, Tree Traversals, Binary Search Tree, Insertion and Deletion in BST, Simple implementation of Multiway search trees
4. Implementation of Searching and Sorting Algorithms
5. Graph Implementation, BFS, DFS.