

Lab with Capstone Project- Advanced Data Structure with Python Programming

Code: CS32141CS	Course Type: Prct.	Semester: I
Evolution Scheme (TA-MSE-ESE): 25-25-50	Total Marks: 100	L-T-P (Credits): 0-0-4 (2)

Pre-Requisites: Basic programming in C/C++.

Course Objective: Implementation of complex data structures and high-performance algorithms using Python programming language

Course Outcomes: At the end of the course, the student will be able to

CO-1	Implementation of elementary data structures using Python
CO-2	Implementation of key data structures like Heaps and Trees using Python
CO-3	Implementation of Greedy and Dynamic programming paradigm using Python
CO-4	Implementation of Backtracking and Divide 7 Conquer paradigm using Python

Course Articulation Matrix:

PO	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5
CO-1	3	2	1	-	-
CO-2	3	2	1	-	1
CO-3	3	2	-	-	3
CO-4	3	2	1	1	-

1 - Slightly; 2 - Moderately; 3 - Substantially

List of Experiments:

UNIT 1: Implement the various operation on Arrays, Stack, Queue and Linked Lists using Python programming

UNIT 2: Implement various operations on Min-Max heaps, Binomial heaps, Fibonacci heaps using Python programming

Implement various operations (Search, Insertion, Deletion, Rotation) on Binary Search Trees, Red-Black Trees, AVL Trees, Splay Trees using Python programming

UNIT 3: Implement Minimum Spanning Trees and Dijkstra using Python programming
Implement Matrix Chain Multiplication and Bellman-Ford using Python programming

UNIT 4: Implement DFS, N-Queens Problem using Python programming
Implement Quick Sort, Merge Sort, Binary Search using Python programming

Learning Resources:

Textbooks:

- [1] Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2022). Introduction to Algorithms (4th ed.). MIT Press.
- [2] E. Horowitz, S. Sahni, and D. P. Mehta, *Fundamentals of Data Structures in C++*, 2nd ed. Bangalore, India: Universities Press/Silicon Press, 2007.
- [3] Lipschutz, S. (2014). *Data Structures* (Revised 1st ed.). Tata McGraw Hill.
- [4] Pai, G. A. V. (2008). *Data Structures and Algorithms: Concepts, Techniques and Applications*. Tata McGraw Hill.

References:

- [1] G. Brassard and p. Bratley, algorithmics: theory and practice, printice -hall, 1988.
- [2] Horowitz, E., Sahni, S., & Rajasekaran, S., Fundamentals of Computer Algorithms (2nd ed.). Universities Press 2008.
- [3] Mark Allen Weiss- Data Structure and Algorithms Analysis in C++, Pearson education 2002.
- [4] Aho Ullman-- Data Structure and Algorithms Analysis in C++, Pearson education 2002.