Savitribai Phule Pune University S.Y.B.Sc. (Computer Science) **Computer Science Paper - III Course Code: CS 233** Title : Practical course on CS 231 (Data Structures and Algorithms I) and CS 232 (Software Engineering)

Teaching Scheme	No. of Credits	Examination Scheme
4 hrs 20 mins / week	2	IE : 15 marks
Batch Size : 12		UE: 35 marks

Operating Environment:

For Data Structures:

- **Operating system:** Linux
- Editor: Any linux based editor like vi, gedit etc.
- **Compiler** : cc or gcc

Lab Book:

The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Programming Assignments:

Programs should be done individually by the student intheir respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include-timely completion, performance, innovation, efficient codes and good programming practices.

• Internal Evaluation :

- o 10 marks will be given based on a mini project of Software Engineering.
- 5 marks will be allocated for Assignment completion and practical attendance.

• University Evaluation :

• The Practical slip will be of 35 Marks which will be based on Data structures.

Course Contents:

Suggested Assignments for Data Structures – I

Assignment1: Searching Algorithms

Implementation of searching algorithms to search an element using: Linear Search, Sentinel Search, Binary Search (with time complexity)

Assignment 2: **Sorting Algorithms - I**

Implementation of sorting algorithms: Bubble Sort, Insertion Sort, Selection Sort

Assignment 3: Sorting Algorithms - II

Implementation of sorting algorithms: Quick Sort, Merge Sort, Counting Sort

Assignment 4: Singly Linked List

1. Dynamic implementation of Singly Linked List to perform following operations: Create, Insert, Delete, Display, Search, Reverse

2. Create a list in the sorted order.

Assignment 5: Doubly Linked List

1. Dynamic implementation of Doubly circular Linked List to perform following operations: Create, Insert, Delete, Display, Search

Assignment 6: Linked List Applications

1. Merge two sorted lists.

Addition of two polynomials in a single variable.

Assignment 7: Stack

1. Static and Dynamic implementation of Stack to perform following operations: Init, Push, Pop, Peek, Isempty, Isfull

Assignment 8: Applications of Stack

1. Implementation of an algorithm that reverses string of characters using stack and checks whether a string is a palindrome.

- 2. Infix to Postfix conversion.
- 3. Evaluation of postfix expression.

Assignment 9: Linear Queue

1. Static and Dynamic implementation of linear Queue to perform following operations: Init, enqueue, dequeue Peek, IsEmpty, IsFull.

Assignment 10: Circular and Priority Queue

- 1. Implementation of circular queue
- 2. Implementation of priority queue

Suggested Assignments for Software Engineering mini Project	3
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- 1. Prepare detailed statement of problem for the selected mini project
- 2. Identify suitable process model for the same.
- 3. Develop Software Requirement Specification for the project.
- 4. Identify scenarios and develop UML Use case
- 5. Other artifacts: Class Diagram, activity diagram, sequence diagram, component diagram and any other diagrams as applicable to the project.

Sample project titles: (These are just samples, students are suggested to take up different case studies)

- 1. Online mobile recharge system
- 2. Credit calculation system
- 3. Image sharing and editing system
- 4. Internal examination system
- 5. e-learning management system

Savitribai Phule Pune University S.Y.B.Sc. (Computer Science) Computer Science Paper - III Course Code: CS 243 Title : Practical course on CS 241(Data Structures and Algorithms II) and CS 242 (Computer Networks I)

Teaching Scheme	No. of Credits	Examination Scheme
4 hrs 20 mins / week	2	IE : 15 marks
Batch size : 12		UE: 35 marks

Lab Book:

The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course.

Programming Assignments:

Programs should be done individually by the student in the respective login. The codes should be uploaded on either the local server, Moodle, Github or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment.

Assessment:

Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include-timely completion, performance, innovation, efficient codes and good programming practices.

• Internal Evaluation :

- \circ 10 marks will be given based on Networking assignments.
- o 5 marks will be allocated for Assignment completion and practical attendance
- University Evaluation :
 - $\circ~$ The Practical slip will be of 35 Marks which will be based on Advanced Data structures.

Operating Environment:

For Data Structures:

- **Operating system:** Linux
- Editor: Any linux based editor like vi, gedit etc.
- **Compiler** : cc or gcc

Course Contents :-

Assignment 1 Binary Search Tree and Traversals

- 1. Implement Binary Search Tree (BST) to perform following operations on BST– Create, Recursive Traversals - Inorder, Preorder, Postorder
- 2. Perform following operations: insert, delete

Assignment 2 Binary Search Tree Operations

- 1. Implement Binary Search Tree (BST) to perform following operations on BST–copy and mirror image of BST, counting leaf, non-leaf and total nodes.
- 2. Level-order traversal of binary search tree using queue.

Assignment 3 Applications of Binary Tree

- 1. Sort set of elements using Heap sort
- 2. Encode a set of characters using Huffman encoding

Assignment 4 Graph implementation

- 1. Implement Graph as adjacency matrix and adjacency list
- 2. Calculate indegree and outdegree of vertices
- 3. Graph traversals: BFS and DFS.

Assignment 5 Graph Applications - I

- 1. Implementation of Topological sorting
- 2. Implementation of Prims/Kruskals Minimum spanning tree algorithm

Assignment 6 Graph Applications - II

- 1. Implementation of Dijkstra's shortest path algorithm for finding Shortest Path from a given source vertex using adjacency cost matrix.
- 2. Implementation of Floyd Warshall algorithm for all pairs shortest path.

Assignment 7 Hash Table

- 1. Implementation of static hash table with Linear Probing.
- 2. Implementation of static hash table with chaining.

Assignment 8 Hash Table-2

1. Implementation of linked hash table with chaining.

Assignment 9 Networking Assignment

Assignment 10 Networking Assignment