JEPPIAAR
ENGINEERING COLLEGE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Subject Name: CS3451- Introduction to Operating Systems

Year/ Semester: II/ IV

Faculty Name: Mr. Ashiq Irphan

Academic Year: 2024–2025

Title of Activity:

Exploring Stack, Queue, and Tree Traversals using Virtual Labs (V-Lab)

Objective of the Innovation:

To provide students with a **hands-on, simulation-based learning experience** for core data structures like **stack, queue**, and **binary tree traversals**, using **Virtual Labs (V-Labs)**. The aim was to enhance understanding through visual experimentation and step-by-step code execution.

CO & PO Mapping

Implement and trace the execution of stack, queue, and tree traversal operations	CO2
Problem Analysis	PO2
Investigation of Problems	PO4
Modern Tool Usage	PO5
Lifelong Learning	PO12

Brief Description of the Activity:

In order to make abstract concepts in **Stack, Queue**, and **Tree Traversals (Inorder, Preorder, Postorder)** more concrete and visual, the **Virtual Labs (V-Lab)** platform was integrated into classroom teaching.

The faculty guided students through:

- **Stack and Queue operations**: push, pop, enqueue, dequeue with animations

- **Tree traversal visualizations**: Interactive representation of recursive calls and node visits

- **Dry-run tracing of algorithms** in step-wise execution mode

- **Lab tasks and exercises** available in the V-Lab platform for post-class reinforcement

The lab enabled students to **practice logic, visualize memory representation**, and build confidence in coding concepts before implementing them independently.

Tool/Innovation Used:

Virtual Labs (V-Labs by MHRD/NMEICT)
Website: https://vlab.co.in/

Key Benefits:

- Simulation of code execution with real-time visuals

- Safe, low-pressure practice environment

- Reinforces classroom learning with experimentation

- Accessible remotely anytime, no local setup required

Topics Covered Using the Tool:

- Stack: Push, Pop, Peek operations

- Queue: Enqueue, Dequeue, Circular Queue concepts

- Binary Tree: Inorder, Preorder, Postorder Traversal

- Recursive traversal logic visualization

- Time complexity and memory visualization

Learning Outcomes Achieved by Students:

- Understood the internal working of linear and non-linear data structures

- Observed and corrected mistakes using step-wise simulation

- Visualized the recursive stack frame in tree traversal

- Practiced data structure operations without compiler dependency

- Gained confidence to apply concepts in coding and practical exams

Impact and Reflections:

- Increased participation in lab sessions

- Improved student understanding of algorithmic flow

- Helped weaker students visualize and catch up

- Reduced coding fear for beginners

- Created a more interactive and student-centered classroom