DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.Tech. I Year III Term

Assignment

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Branch	CSE
Year and Term	I Year III Term
Course Name	Research Publication and Ethics
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Assessment Type	Assignment
Module Number	2

Assignment on Virtual Labs

1. Introduction

Virtual Labs are interactive online platforms that simulate real laboratory experiments. They aim to enhance students' conceptual understanding by allowing them to perform experiments virtually from anywhere.

2. Purpose and Objectives

The objective of Virtual Labs is to complement physical labs with simulation-based learning, making experimentation accessible and repeatable. It supports remote learning and helps students improve their understanding of concepts through virtual practice.

3. Features of Virtual Labs

- Interactive simulations and animations
- Theory, procedure, simulation, and quizzes for each experiment
- Available in various subjects and engineering streams
- Supports low-bandwidth usage
- Accessible anytime, anywhere

4. Subjects Covered

- Physics
- Chemistry
- Electrical and Electronics Engineering
- Computer Science and Engineering
- Mechanical Engineering
- Civil Engineering
- Biotechnology and Biomedical Engineering

5. Access and Usage

Students and faculty can access Virtual Labs via the official portal: https://www.vlab.co.in. This initiative is supported by the Ministry of Education under NMEICT and coordinated by IIT Delhi.

6. Benefits of Using Virtual Labs

- Enables safe, repeatable, and flexible experimentation
- Prepares students before real lab sessions
- Helps in learning from home during remote classes
- Enhances visualization and understanding of theoretical concepts

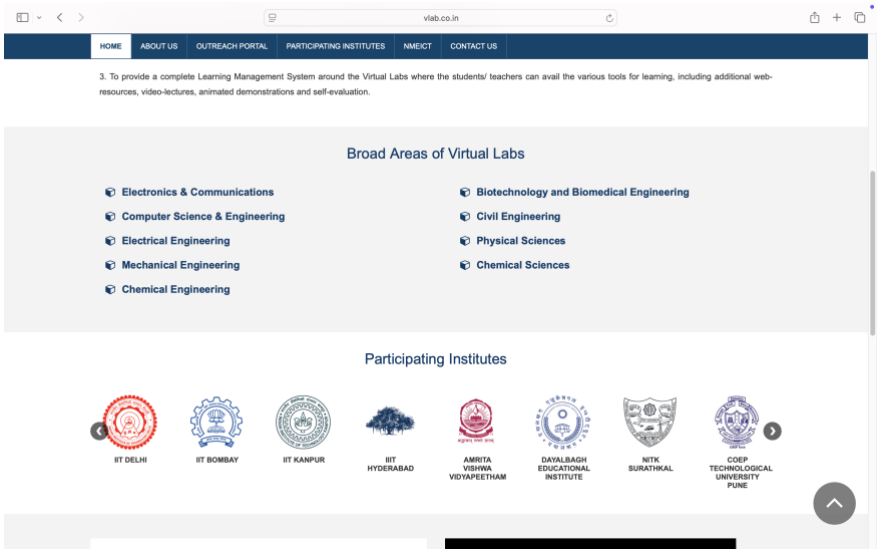
7. Sequence of Steps to Perform a Virtual Experiment (Mechanical Branch)

1. **Visit the Virtual Lab Portal**
   - Open https://www.vlab.co.in
   - Navigate to *Mechanical Engineering* under the *Broad Areas of Virtual Labs*
2. **Select the Relevant Lab**
   - Choose a specific lab such as:
     - *Kinematics and Dynamics of Machines Lab*
     - *Thermodynamics Lab*
     - *Strength of Materials Lab*
     - *Heat and Mass Transfer Lab*
     - *Fluid Mechanics Lab*
3. **Choose the Experiment**
   - From the list, select the experiment you want to perform, for example:
     - "Torsion Test"
     - "Bernoulli's Theorem"
     - "Pin Fin Heat Transfer"
     - "Governor Mechanism"
4. **Read the Theory**
   - Go to the **Theory** section to understand the background, equations, and objectives of the experiment.
   - This helps to know the concept and expected behavior of the system.
5. **Study the Procedure**
   - Review the **Procedure** step-by-step to understand how the experiment is to be conducted.
   - Know the inputs, controls, and output parameters to observe.
6. **Run the Simulation**
   - Open the **Simulator** tab.
   - Set initial values (e.g., speed, load, temperature, length) as per the instructions.
   - Click on **Start Simulation** or equivalent button to begin the experiment.
   - Observe changes and record readings.
7. **Perform Calculations (if needed)**
   - Use the observed data to perform calculations such as torque, efficiency, stress, heat transfer rate, etc.
   - Compare theoretical and simulated results if applicable.
8. **Answer Viva or Self-Evaluation Questions**
   - Attempt the **Viva Voce** or **Self-Assessment** section to test your understanding of the experiment.
   - These may include multiple choice or short-answer questions.
9. **Download or Record Observations**
   - Take screenshots or notes of the simulation output and graphs.
   - Use the data to prepare your lab record or report.
10. **Repeat for Better Understanding (Optional)**

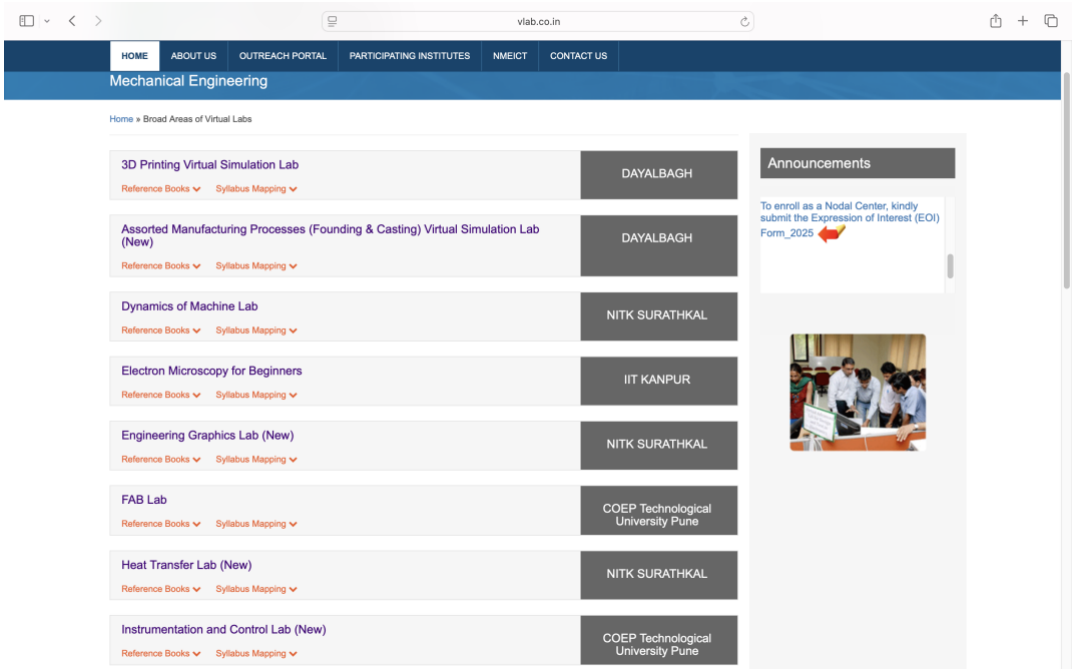
- You may reset and repeat the experiment with different inputs to observe variation in results.

8. Sample screenshots showing the Virtual Labs interface and experiment module:

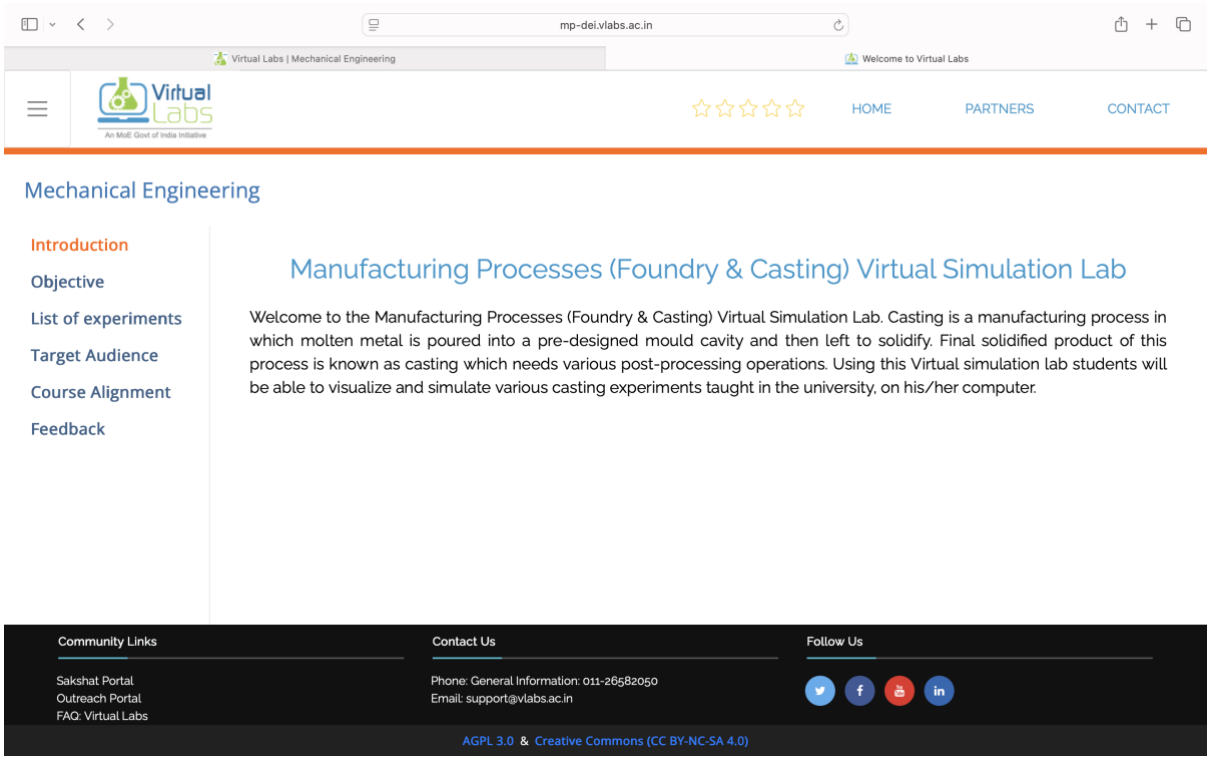
8.1Broad Areas



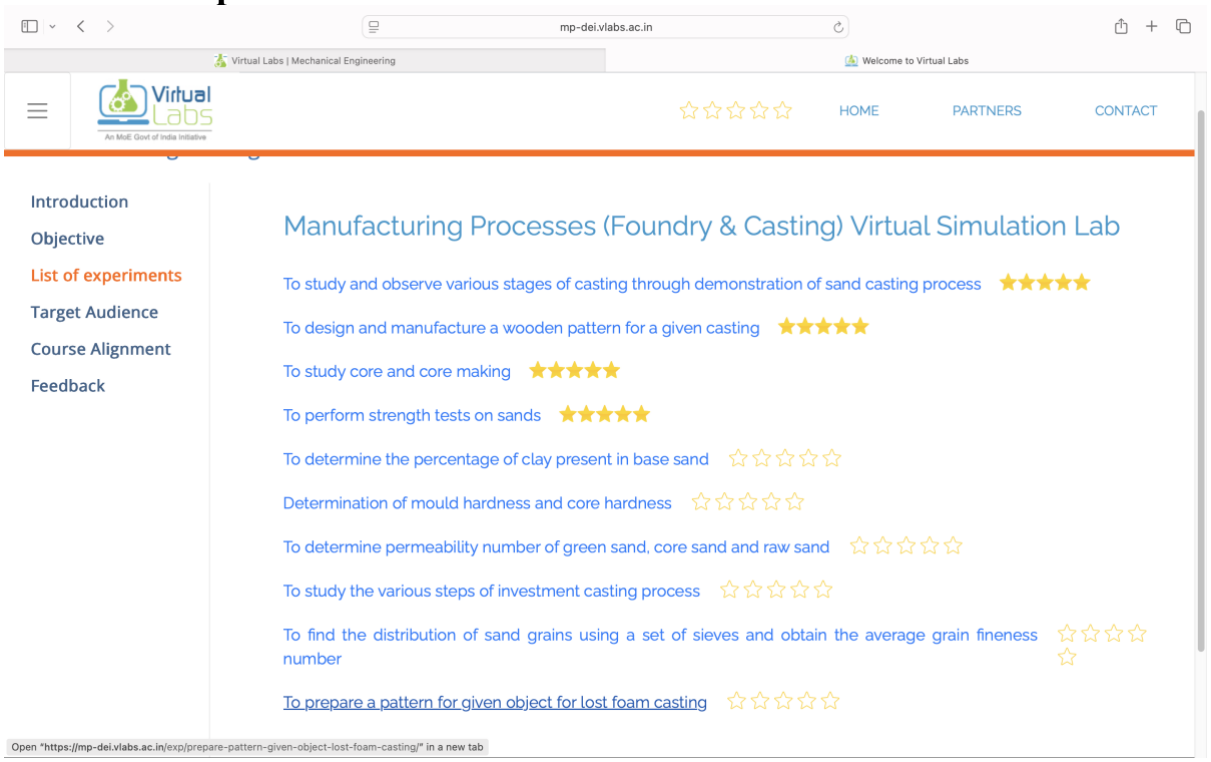
8.2 Broad areas of virtual labs in Mechanical Engineering



8.3 Selection of Lab(Manufacturing Processes (Foundry & Casting) Virtual Simulation Lab)

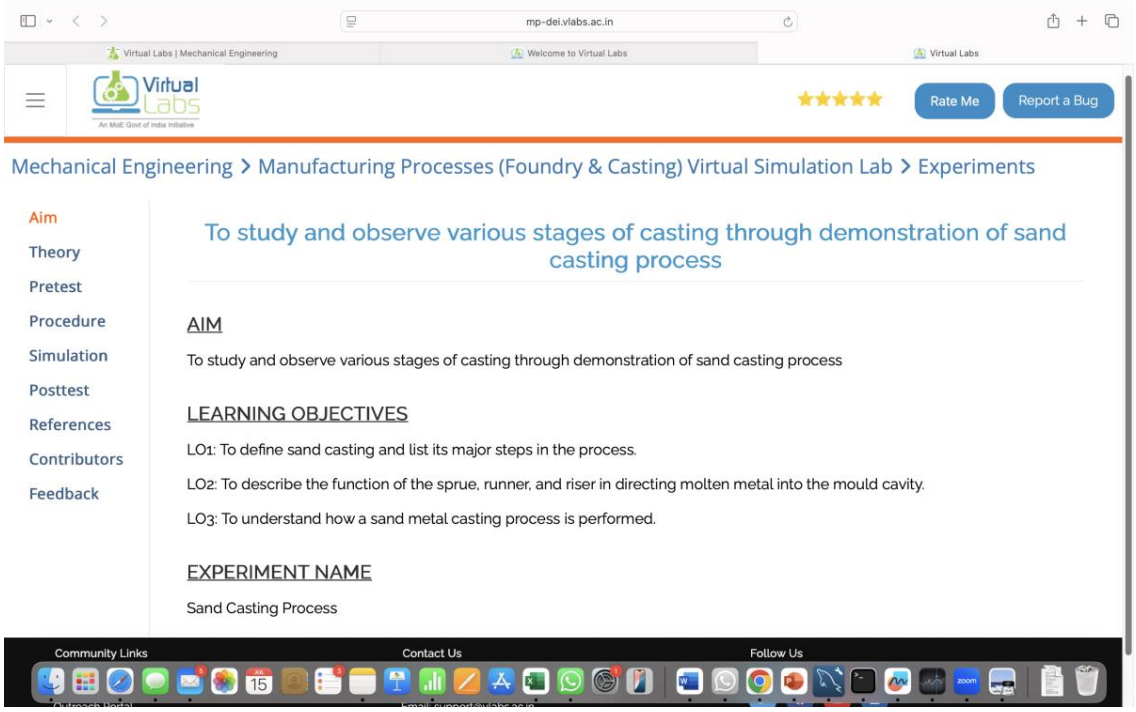


8.4 List of Experiments

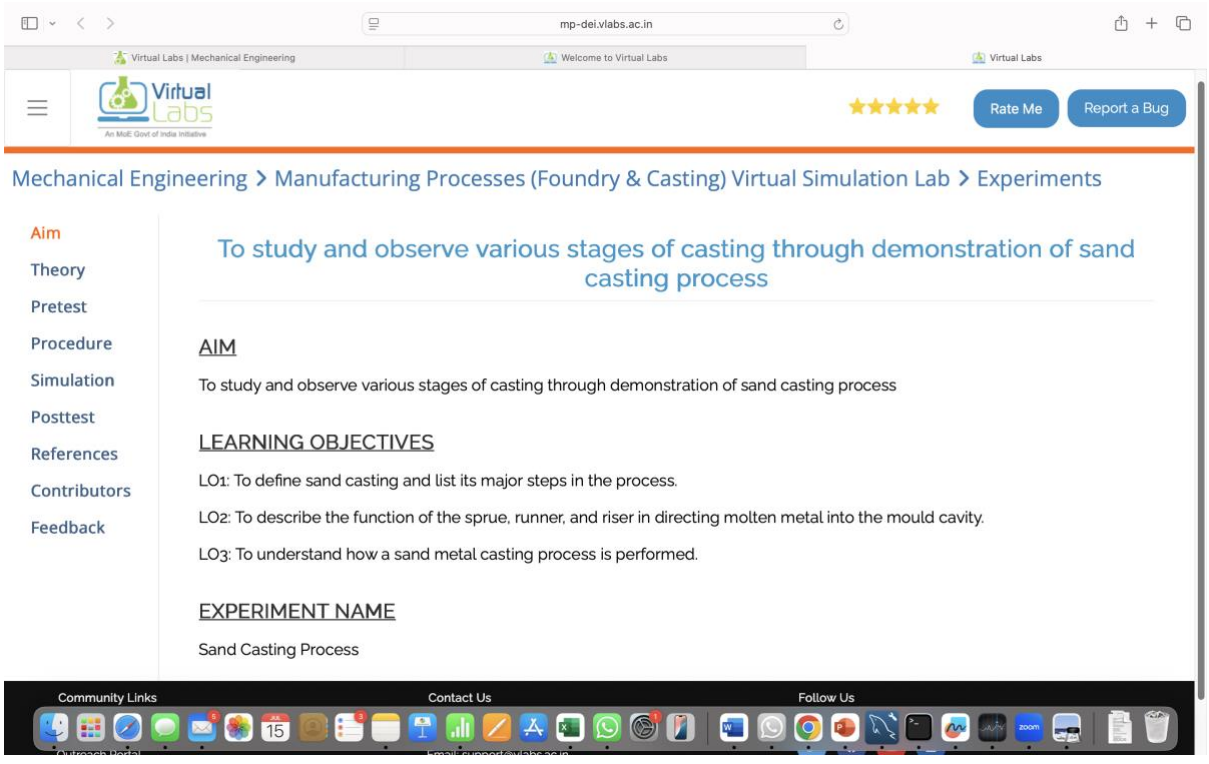


8.5 Selection of an experiment(To study and observe various stages of casting through demonstration of sand casting process)

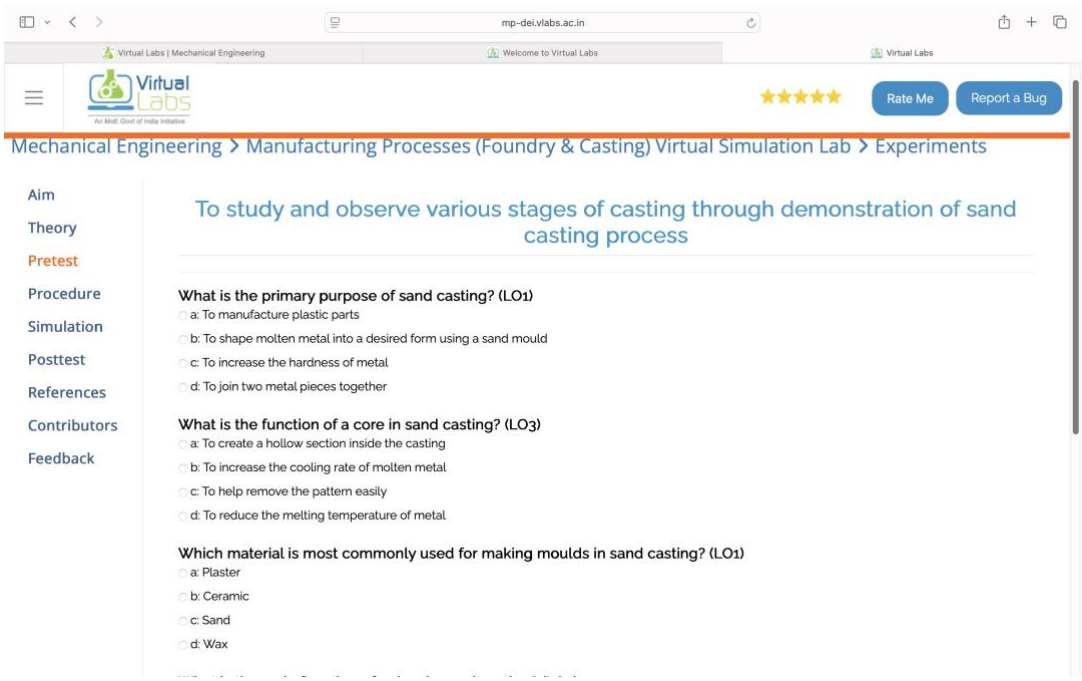
8.5.1 Aim



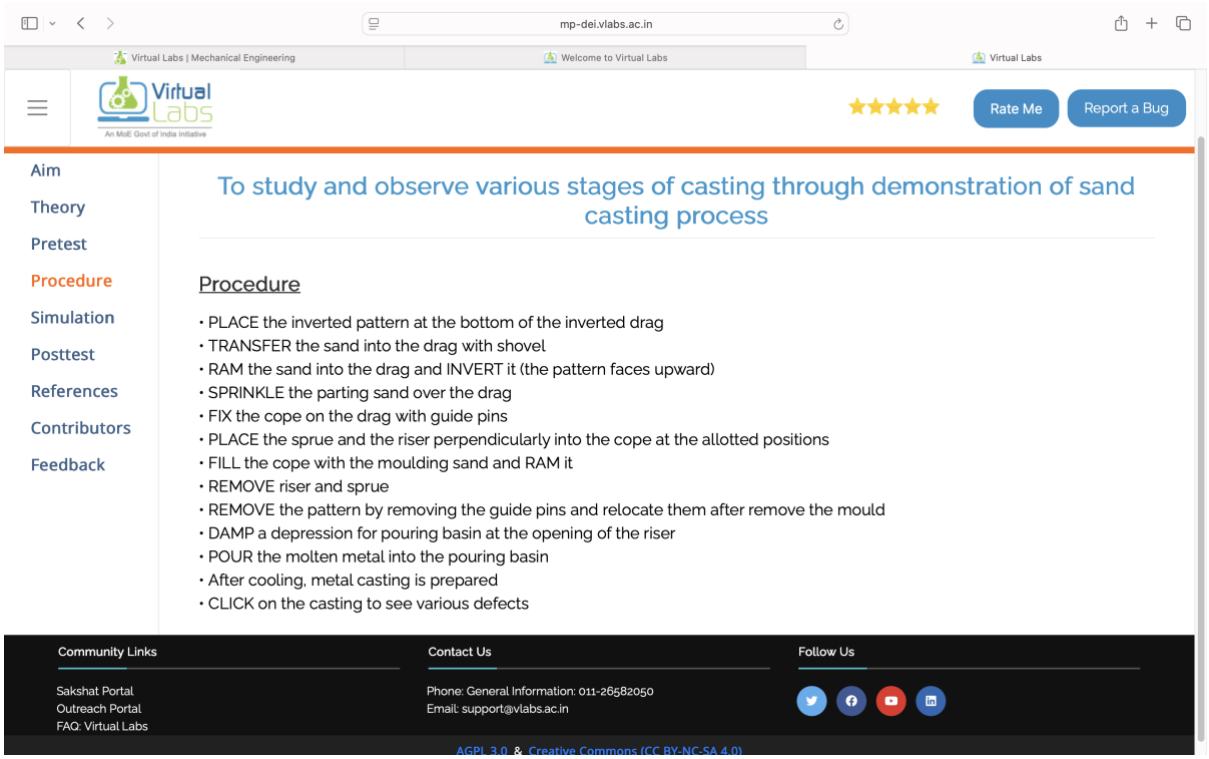
8.5.1 Theory



8.5.2 Pretest

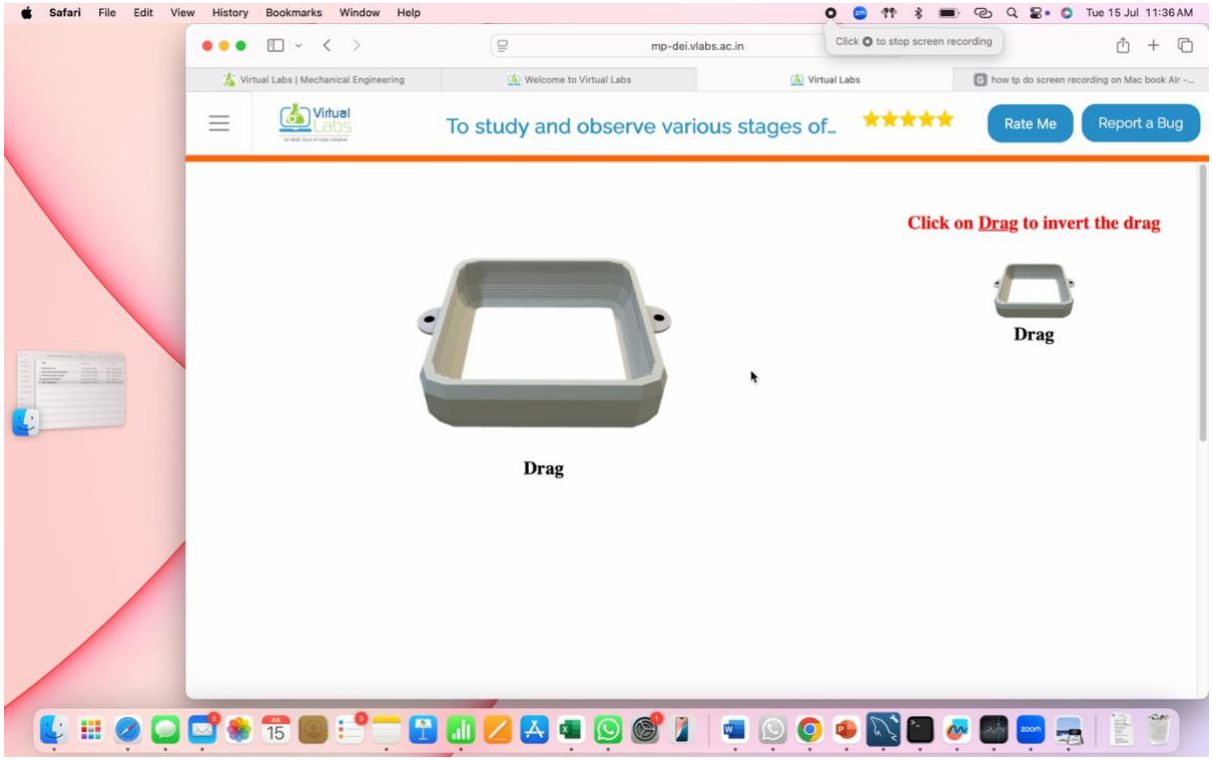


8.5.1 Procedure



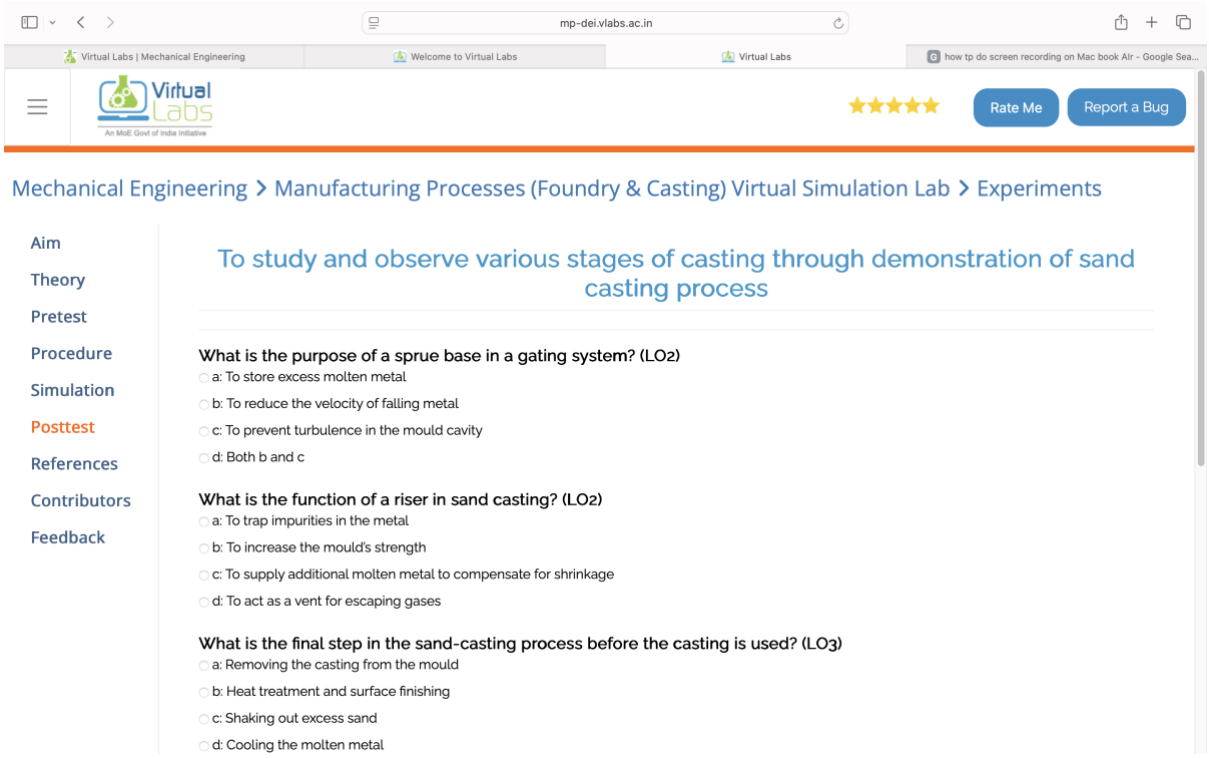
8.5.1 Simulation

(Screen Recording Video of the Simulation)

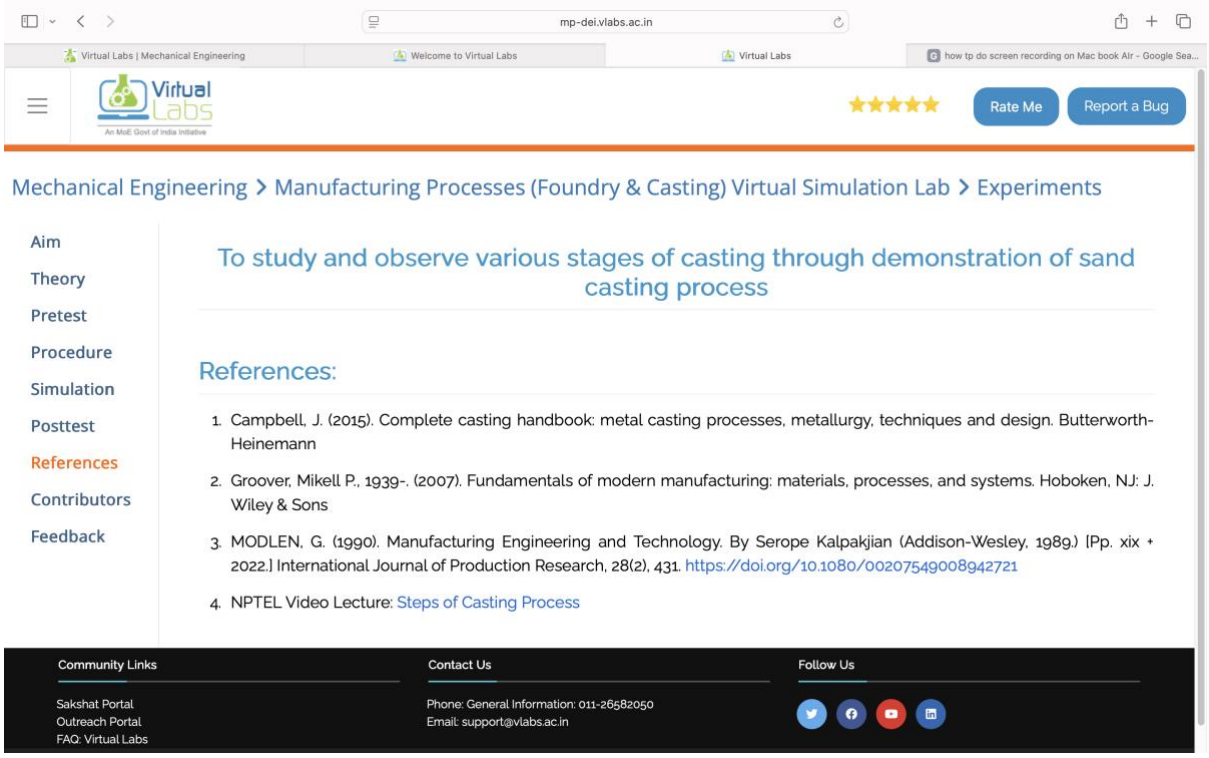


https://drive.google.com/file/d/1aJqVNBlPg6jPRheQfg6AFegopJfCRL3T/view?usp=share_link

8.5.1 Posttest



8.5.1 References



9. Conclusion

Virtual Labs are powerful educational tools that help bridge the gap between classroom theory and real-world application. By providing an interactive and flexible learning environment, they allow students to explore, experiment, and understand complex concepts at their own pace. Especially in situations where access to physical laboratories is limited, virtual labs offer an effective alternative to ensure continuous and practical learning. Their role in building foundational skills, enhancing safety, and promoting digital literacy makes them an essential component of modern education