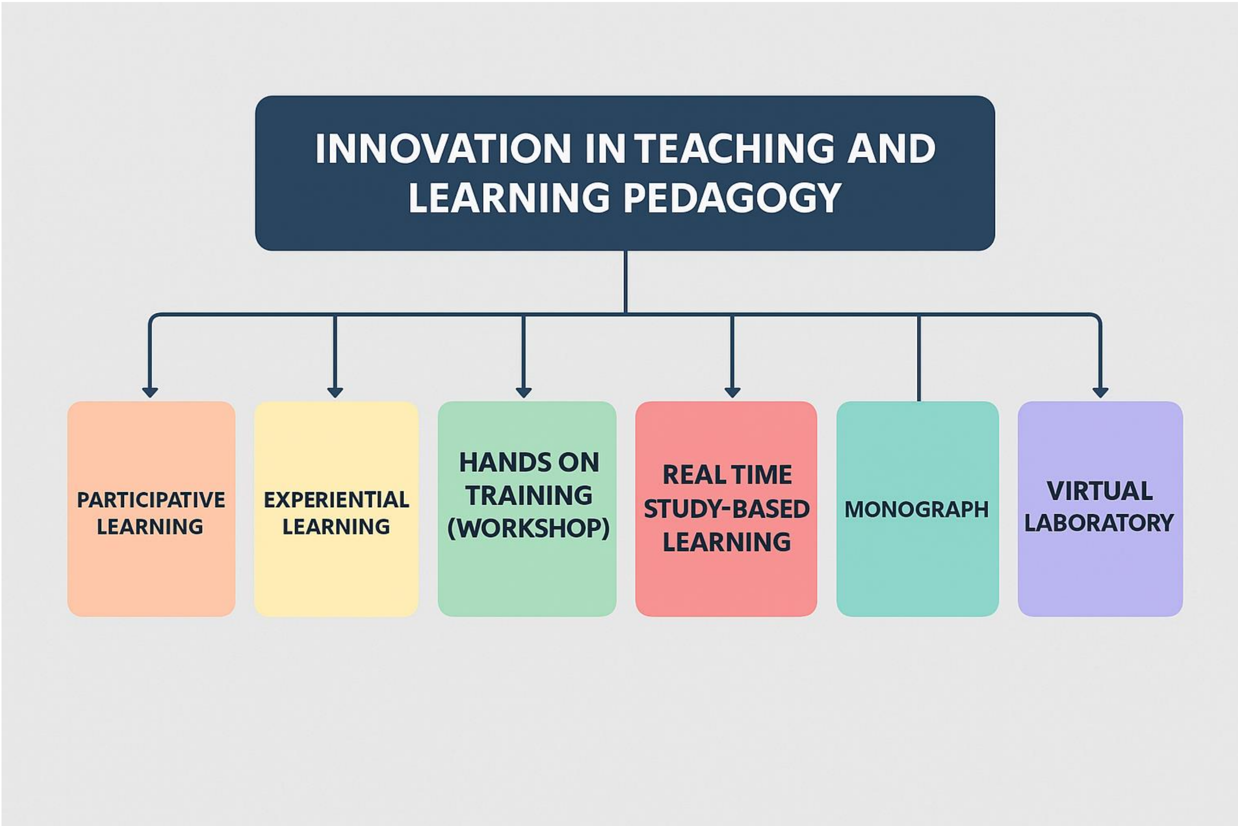


INNOVATION IN TEACHING AND LEARNING PEDAGOGY

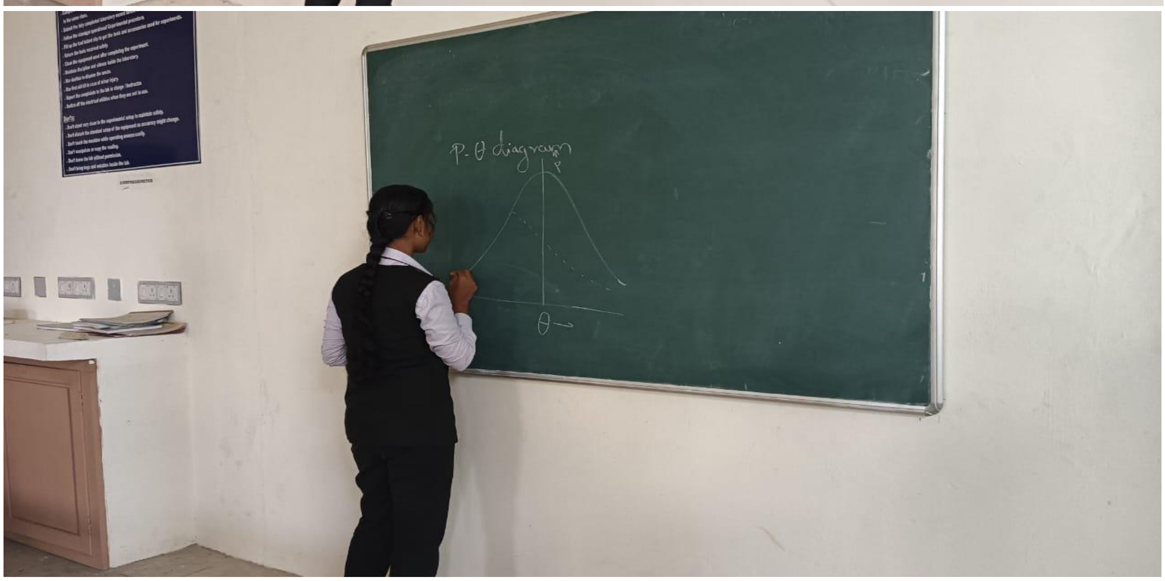
- ✓ **Participative Learning**

Participative learning is an educational approach that actively involves students in the learning process, where they are not passive recipients of information but are encouraged to take an active role in their learning journey. This approach fosters deeper engagement, critical thinking, and skill development by encouraging students to participate in various activities that enhance their understanding.

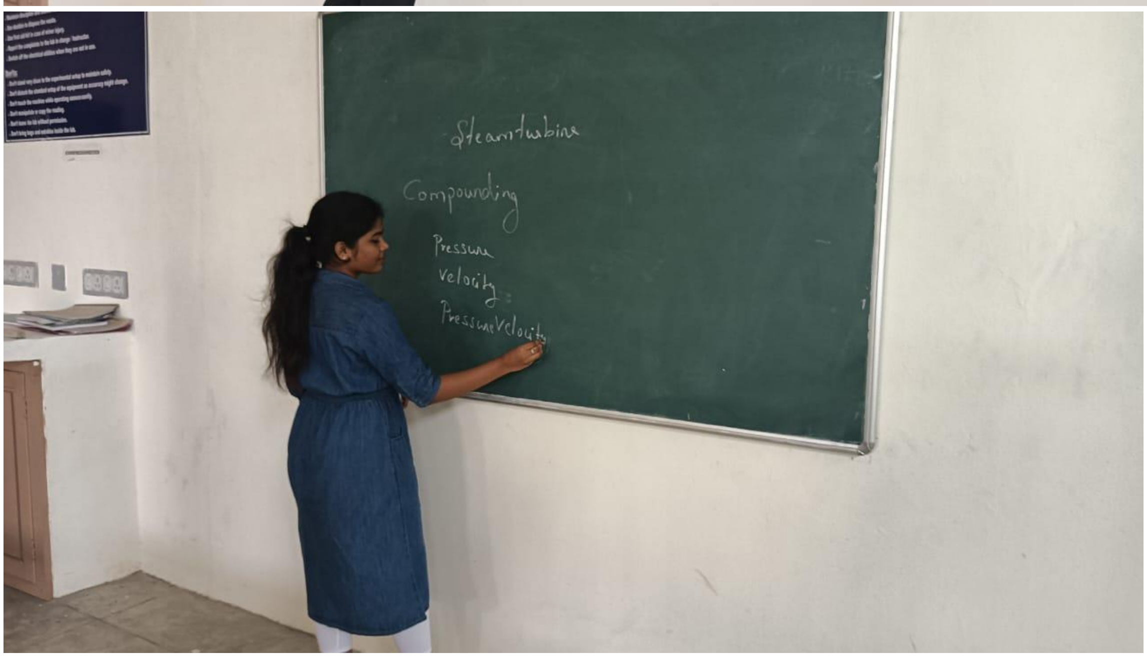
Students are asked to take a seminar in a toughest topic which is already taught by a faculty in their respective courses. It will enhance the students in deeper understanding on the topic

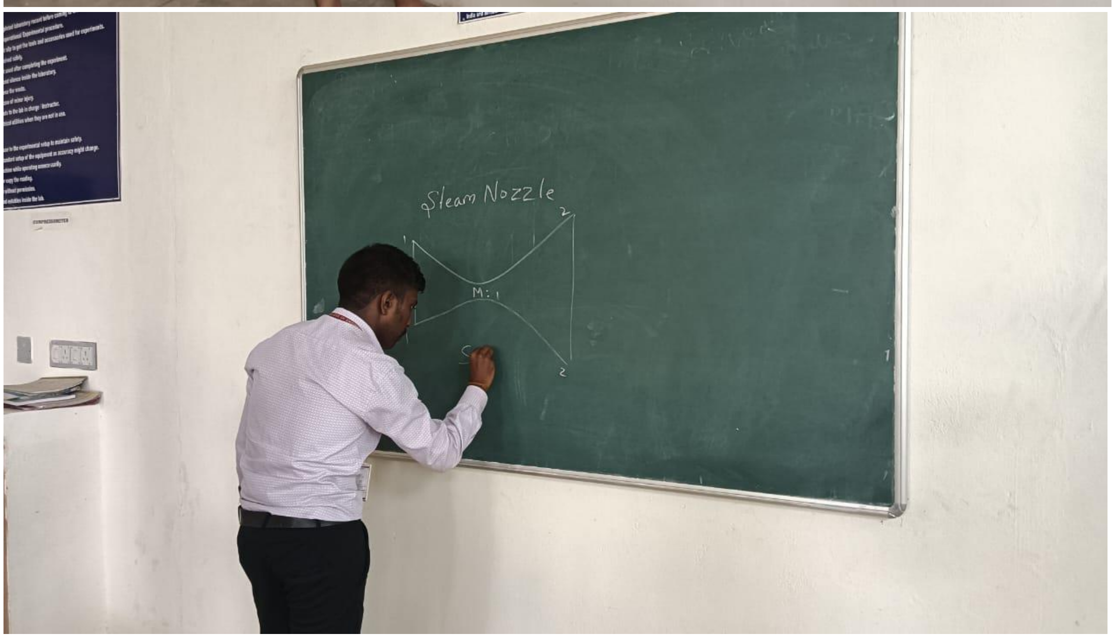
Sample images: Course Name: Thermal Engineering

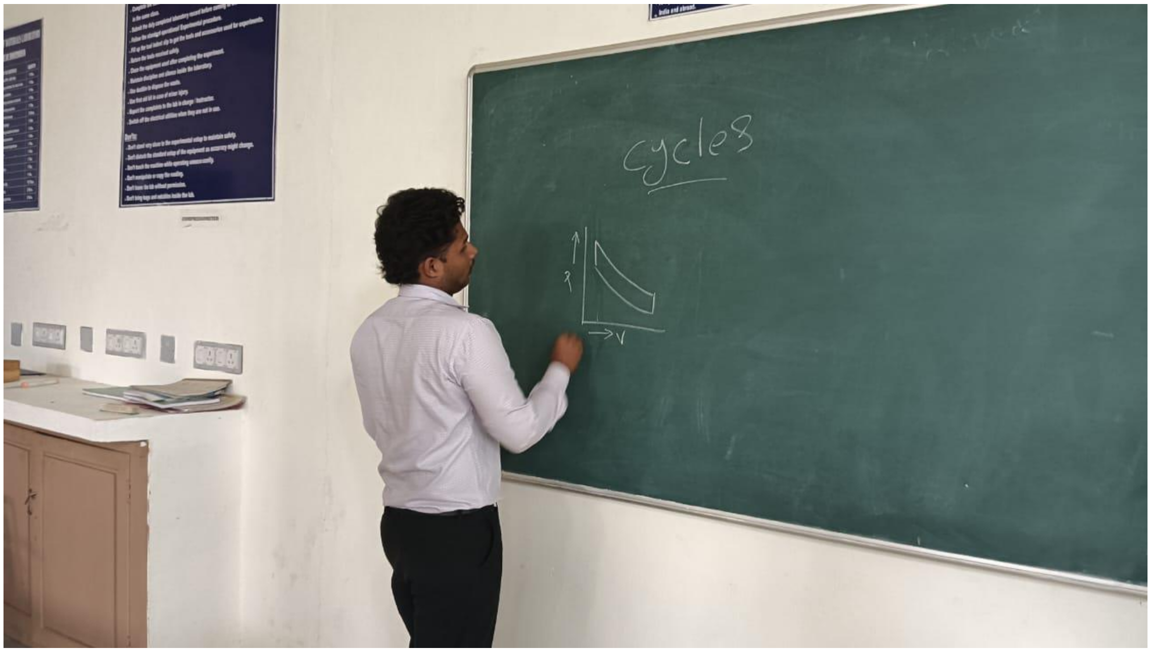

Performance
Brake Power : 2πNT / 60
Indicated Power : Ip = Pm·l·a·n·K / 60x1000


P-θ diagram
θ→

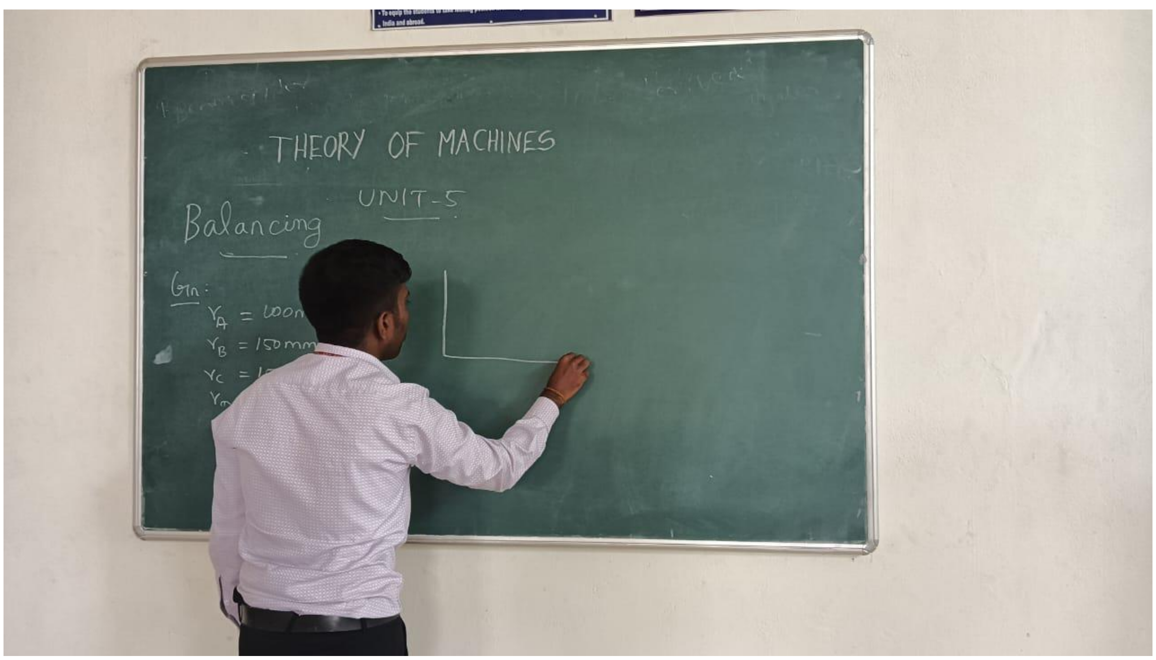

P-θ diagram

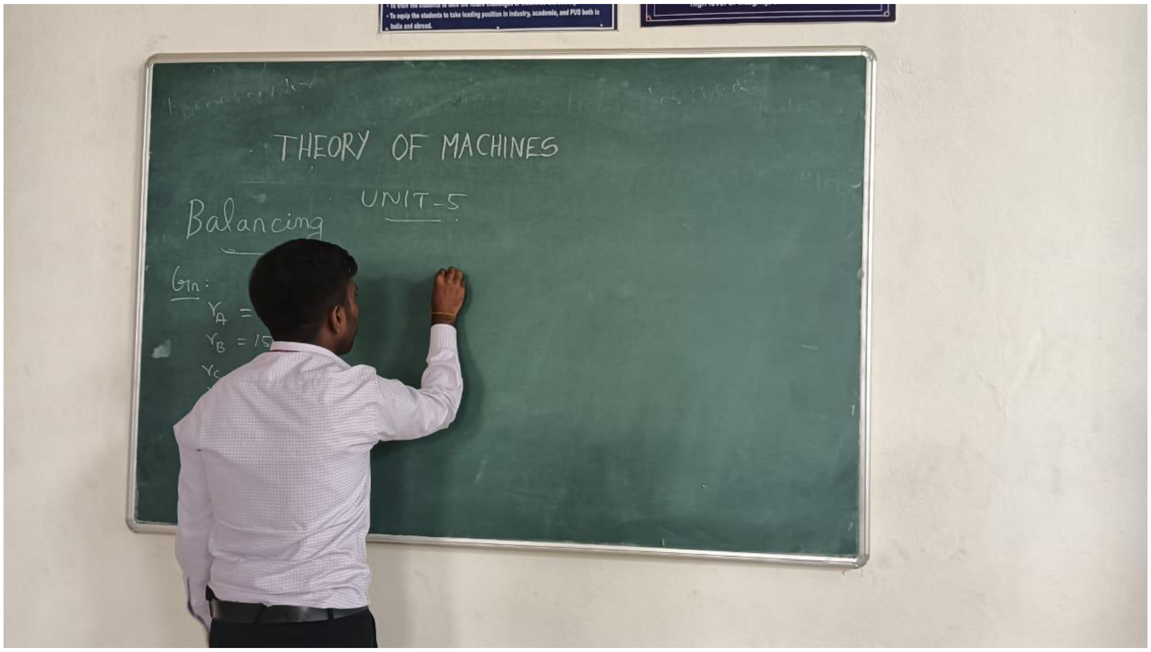

Steamturbine
Compounding
Pressure
Velocity
PressureVelocity

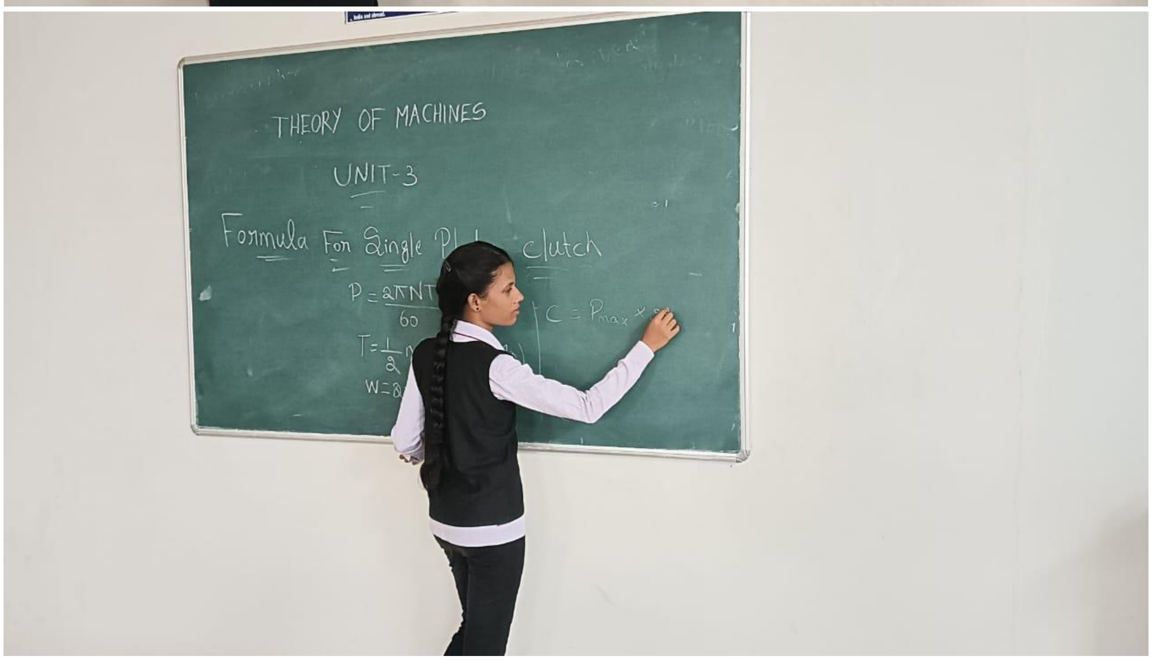

Steamturbine
Compounding
Pressure
Velocity
PressureVelocity

Steam Nozzle

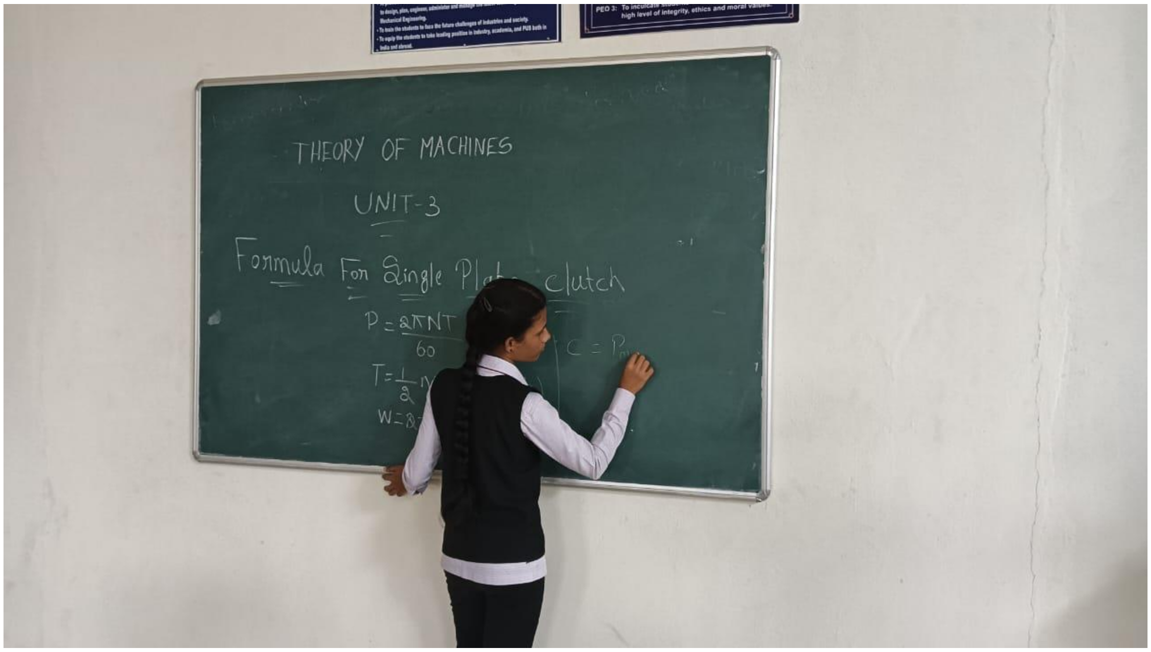


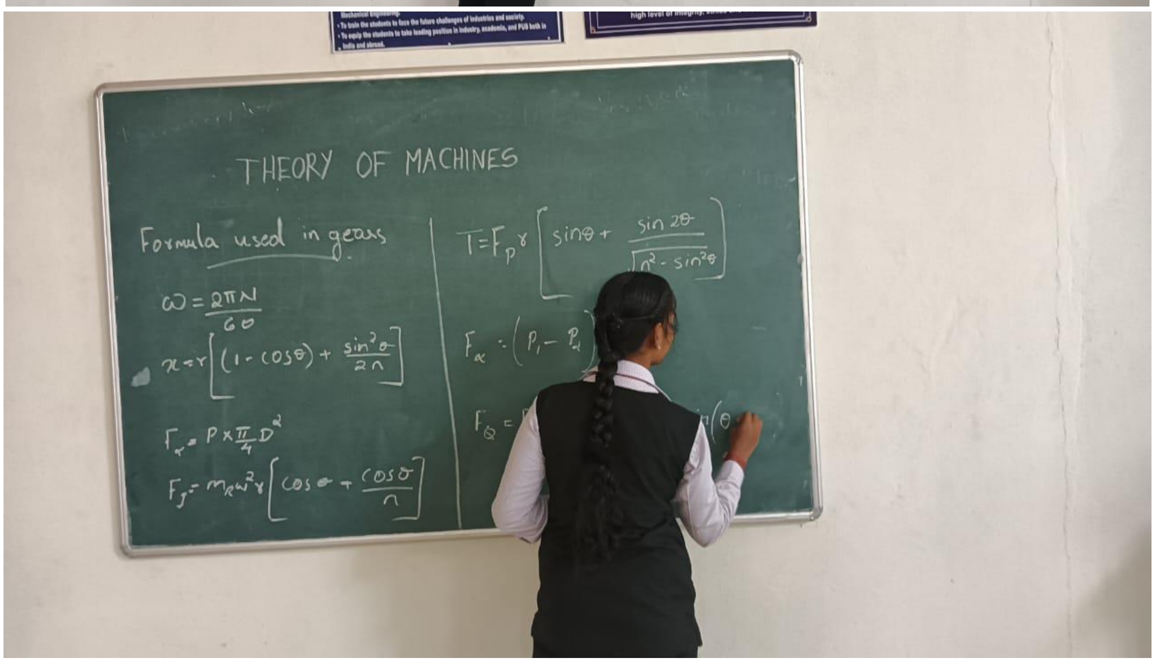
Course Name: Theory of Machines

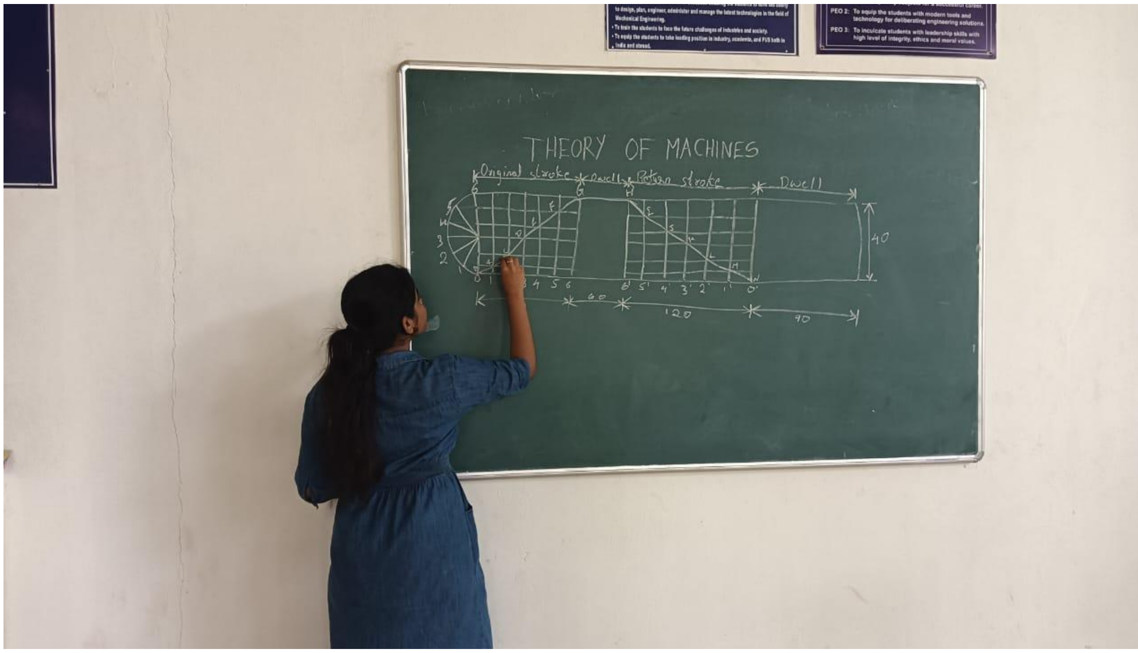


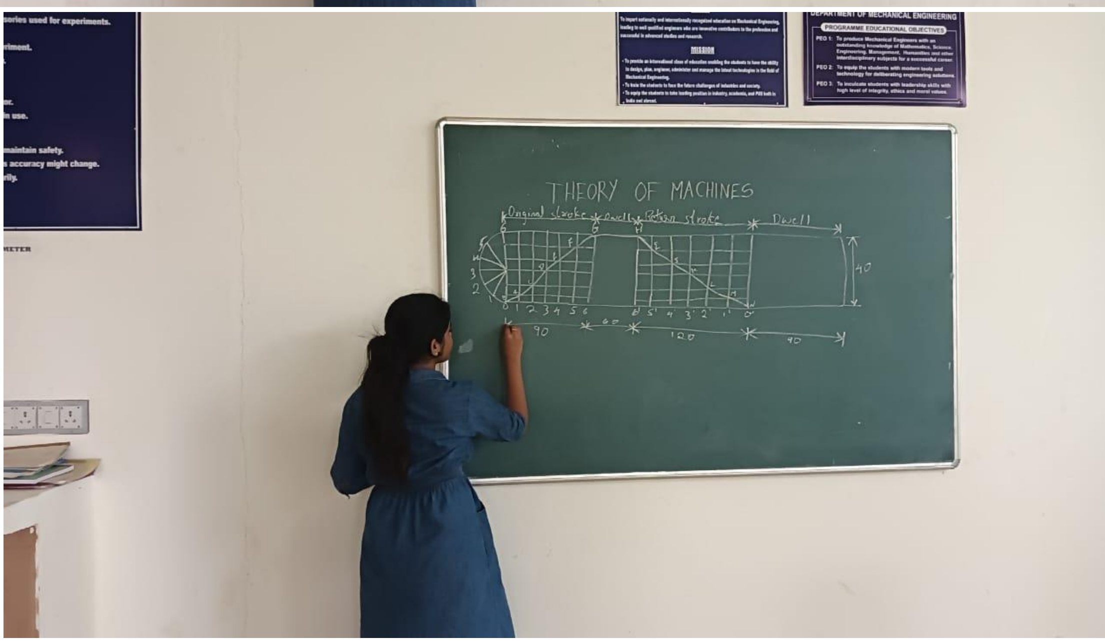

THEORY OF MACHINES
UNIT-5
Balancing


THEORY OF MACHINES
UNIT-3


THEORY OF MACHINES
UNIT-3
Formula For Single
clutch
P = 2πNT / 60


THEORY OF MACHINES
Formula used in gears
ω = 2πN / 60





It’s a sample image of participative learning which is conducted in the department. Faculties will assign a topic for each student to take a seminar. This pedagogy makes the students to more interactive, student-centered approach. This method enhances understanding, encourages peer-to-peer learning, boosts confidence, and helps develop communication and teaching skills with in students**.**

Experiential Learning

Experiential learning in thermal engineering course helps students understand IC engine performance through hands-on experiments. By working with real engines, they measure fuel consumption, power output, and efficiency. They analyze data, perform calculations, and compare results with theoretical values. This practical approach makes learning more engaging and helps students connect concepts to real-world applications. It also improves problem-solving skills and prepares them for engineering challenges in the field.

Name of the Course: Thermal Engineering Course Handled (2024-2025): Mr. P. Vijayan

Experiential learning in Unit 2 of a thermal engineering course helps students understand steam nozzle performance through hands-on experiments. By working with steam nozzles, they observe how steam expands, measure velocity and pressure changes, and analyze efficiency. They perform calculations to compare actual performance with theoretical values. This practical approach makes learning more interactive, helping students grasp key concepts like velocity coefficient and mass flow rate. It also improves problem-solving skills and prepares them for real-world engineering applications.

Name of the Course: Thermal Engineering Course Handled (2024-2025): Mr. P. Vijayan

Experiential learning in an Engineering Thermodynamics course helps students understand the Zeroth Law of Thermodynamics by using water as the material. By measuring water temperature with a K-type thermocouple and a thermometer, they observe thermal equilibrium in action. During a boiling water experiment, they see how heat transfer occurs and how temperature remains constant at the boiling point. These hands-on activities make learning more engaging, helping students connect theory to real-world applications and improve their measurement skills.

Name of the Course: Engineering Thermodynamics Course Handled (2024-2025): Mr. P. Vijayan

Experiential learning in a laboratory environment, where Mr. S. Ajith Kumar is demonstrating an experimental setup to a group of students for the course of Hydraulics and Pneumatics. This hands-on learning approach bridges the gap between theoretical knowledge and real-world application. It enhances students' understanding of technical concepts, fosters curiosity, and develops problem-solving and observational skills essential for engineering and science education.

Name of the Course: Hydraulics and Pneumatics Course Handled (2024-2025):Mr.S. Ajith Kumar

Students are being guided by our faculty on the operation of a lathe machine. This type of experiential learning allows students to gain practical skills, understand machine components and functions, and build technical confidence. Such sessions are vital in engineering education as they complement theoretical lessons with real-world industrial exposure.

Name of the Course: Manufacturing Process Course Handled (2024-2025):Mr.S. Ajith Kumar

Faculty is demonstrating the **thermal conductivity measurement of a spherical ball and composite wall apparatus** to a group of students. This experiment helps students understand how heat transfers through spherical bodies, which is important in thermal insulation, heat exchanger design, and other engineering applications. Through such practical exposure, students gain insight into real-world thermal systems and strengthen their grasp of theoretical concepts. It will make the course Heat and mass transfer to understand deeper.

Name of the Course: Heat and Mass Transfer Course Handled (2024-2025): Mr. S. R. Rajkumar

---

- ✓ **Hand on Training Workshop**

Subject: ME3791 - Mechatronics and IoT

Subject Handled: Mr. S. R. Rajkumar

Innovative Pedagogy: Hands on Training through (https://wokwi.com/) – simulation software (VAC)

Academic year: 2024 – 2025 **Semester:** 07

Objective

The objective of this Value-Added Course (VAC) and hands-on IoT training, integrated into the ME3791 - Mechatronics and IoT course, was to equip students with practical skills in IoT technology and its applications within mechatronics. By using the Wokwi online platform and components like the ESP32 microcontroller, the program aimed to:

- ✓ Develop students' proficiency in sensor integration, data acquisition, and real-time monitoring.
- ✓ Provide hands-on experience in circuit design, programming, and troubleshooting IoT setups.
- ✓ Bridge theoretical concepts with real-world applications to prepare students for modern engineering challenges in automation and smart systems.

Outcome of the Program:

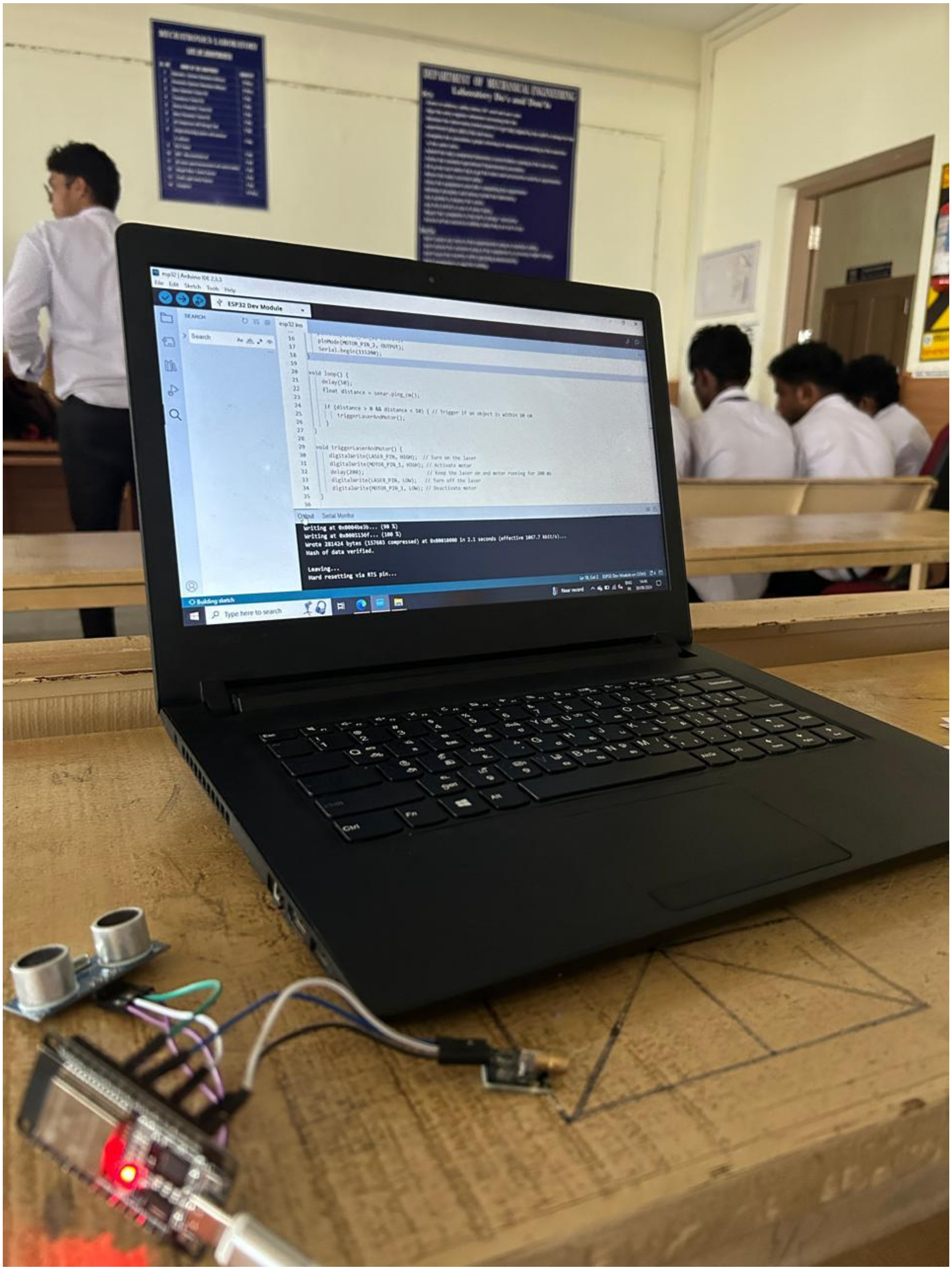
Upon completing the program, students gained essential skills in IoT and mechatronics, enhancing their understanding and capability in:

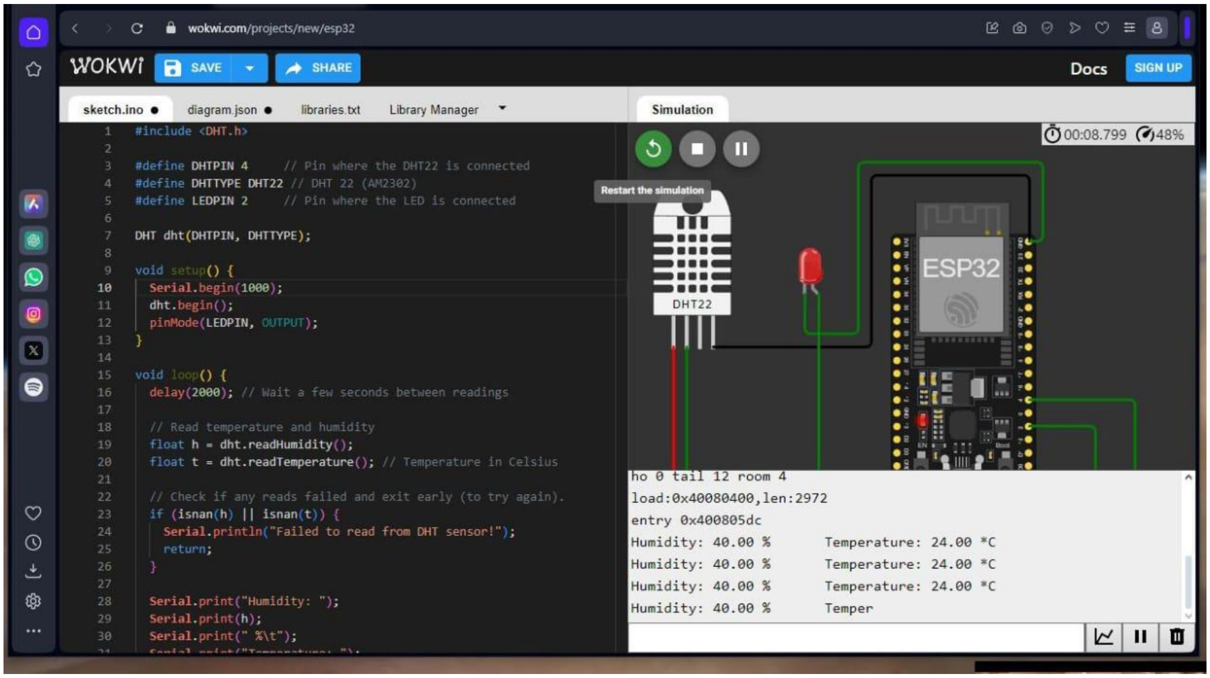
- ✓ Setting up and testing IoT systems to create useful, data-based engineering solutions.
- ✓ Using IoT technologies confidently in smart systems, automated processes, and monitoring tasks.
- ✓ Moving from virtual simulations to real-world setups smoothly, with strong skills in programming and troubleshooting.

Sample Event Pictures

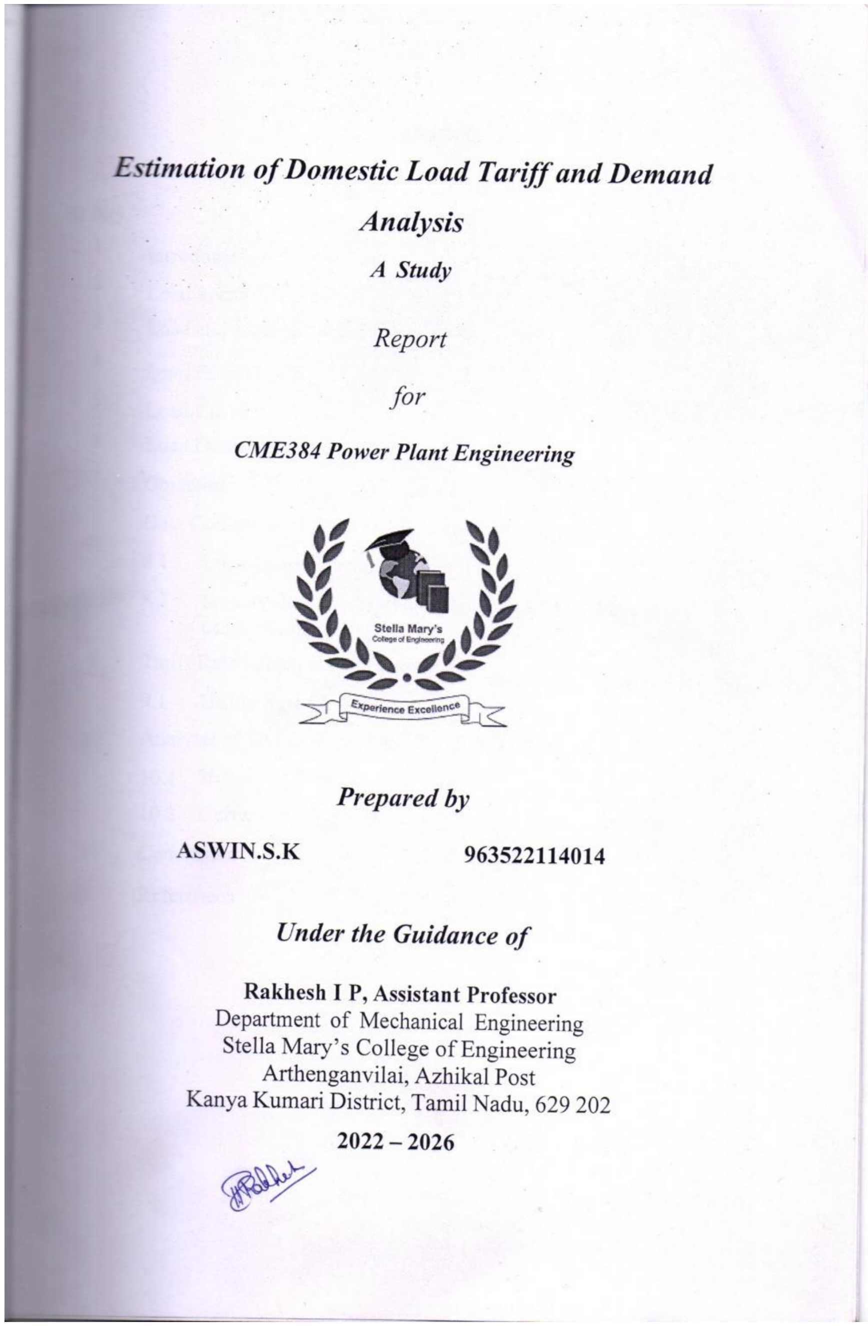

GPS Map Camera
Ganapathipuram, Tamil Nadu, India
48JV+WWR, Ganapathipuram, Tamil Nadu 629202, India
Lat 8.132382°
Long 77.344609°
25/09/24 01:42 PM GMT +05:30
Google


GPS Map Camera
Ganapathipuram, Tamil Nadu, India
48JV+WWR, Ganapathipuram, Tamil Nadu 629202, India
Lat 8.132439°
Long 77.344557°
25/09/24 01:42 PM GMT +05:30
Google


ESP32 Dev Module
void loop() {
delay(50);
float distance = sonar.ping_cm();
void triggerLaserAndMotor() {
Output
Serial Monitor
Hash of data verified.
Leaving...
Hard resetting via RTS pin...
Building sketch
Type here to search


wokwi.com/projects/new/esp32
WOKWI
SAVE
SHARE
Docs
SIGN UP
sketch.ino
diagram.json
libraries.txt
Library Manager
Simulation
00:08.799
48%
Restart the simulation
#include <DHT.h>
#define DHTPIN 4 // Pin where the DHT22 is connected
#define DHTTYPE DHT22 // DHT 22 (AM2302)
#define LEDPIN 2 // Pin where the LED is connected
DHT dht(DHTPIN, DHTTYPE);
void setup() {
Serial.begin(1000);
dht.begin();
pinMode(LEDPIN, OUTPUT);
}
void loop() {
delay(2000); // Wait a few seconds between readings
// Read temperature and humidity
float h = dht.readHumidity();
float t = dht.readTemperature(); // Temperature in Celsius
// Check if any reads failed and exit early (to try again).
if (isnan(h) || isnan(t)) {
Serial.println("Failed to read from DHT sensor!");
return;
}
Serial.print("Humidity: ");
Serial.print(h);
Serial.print(" %\t");
DHT22
ESP32
ho 0 tail 12 room 4
load:0x40080400,len:2972
entry 0x400805dc
Humidity: 40.00 % Temperature: 24.00 *C
Humidity: 40.00 % Temperature: 24.00 *C
Humidity: 40.00 % Temperature: 24.00 *C
Humidity: 40.00 % Temper

✓ **Real Time Study-Based Learning**



Estimation of Domestic Load Tariff and Demand Analysis

A Study

Report

for

CME384 Power Plant Engineering

Prepared by

ASWIN.S.K 963522114014

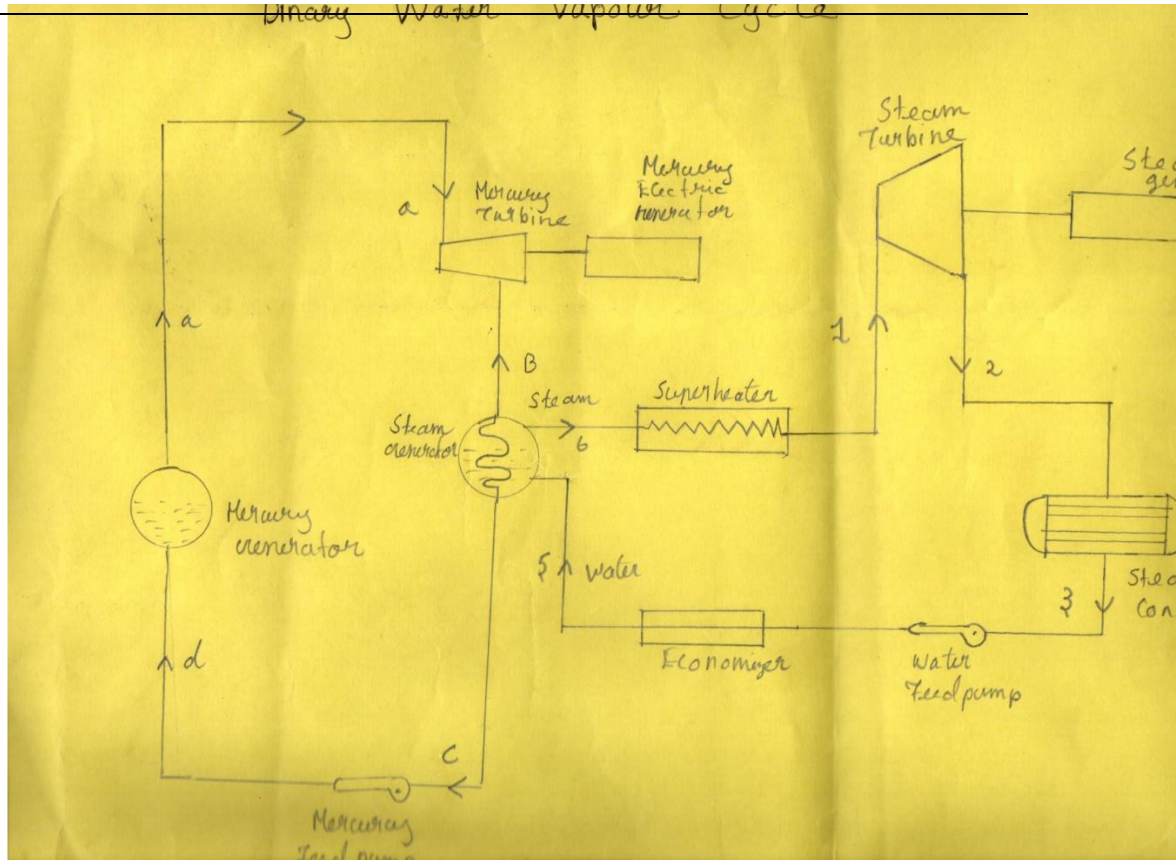
Under the Guidance of

Rakhesh I P, Assistant Professor
Department of Mechanical Engineering
Stella Mary's College of Engineering
Arthenganvilai, Azhikal Post
Kanya Kumari District, Tamil Nadu, 629 202

2022 – 2026

This study provides the student with the opportunity to practically assess domestic load tariff and power demand, bridging theoretical knowledge from CME384 Power Plant Engineering (unit 5) with real-world utility pricing models and energy consumption analysis.

MONOGRAPH



Monographs are used in teaching and learning pedagogy for better understanding the concepts.

Hand on Training Learning

Activity Title: **Hands-on Training on Thermal Energy Storage System Using Paraffin Wax**

Objective:

- To provide practical exposure to thermal energy storage using phase change materials (PCMs), specifically paraffin wax.
- To demonstrate temperature monitoring techniques during phase transition.
- To develop students' technical understanding and skills related to real-world thermal energy storage applications.

Summary:

As part of the CME364 Energy Storage Devices curriculum, a hands-on training session was conducted focusing on Thermal Energy Storage Systems. Students worked with paraffin wax as the phase change material, heating mantle, and thermometer/digital data logger for temperature tracking.

The session covered:

- Safe heating and handling of thermal storage materials.
- Observing the melting and solidification process in PCMs.
- Monitoring and recording temperature changes during thermal cycling.
  This participative learning approach enabled students to visualize energy absorption and release patterns during the phase change process.

Outcomes:

At the end of the session, students were able to:

- Explain the principle of latent heat storage in PCMs.
- Describe the thermal behaviour of paraffin wax during heating and cooling.
- Use laboratory equipment to monitor and record thermal data.
- Relate theoretical concepts to practical energy storage techniques.
- Work effectively in a group to conduct and analyse thermal experiments.

The Gaps which is found in curriculum for CME364 Energy Storage Device is filed through this activity

PO6 – Understand the safety measures in handling the system

PO8 – Responsible handling of instrument

PO9 – Students collaborated in teams during the experiment, shared tasks, and contributed to data recording and analysis

PO10 – Students explained experimental observations

PO11 – Students managed time and roles effectively to conduct the experiment

PO12 – Exposure to modern thermal storage techniques encouraged students to explore further innovations in sustainable energy systems.

Sample Images

VIRTUAL LABORATORY

The Virtual Labs (V-Lab) initiative in India was launched by the Ministry of Education (formerly MHRD) under the National Mission on Education through ICT (NMEICT) to bridge the gap between theoretical knowledge and practical learning, especially in engineering and science. It was officially launched in 2010 and is led by premier institutes like IITs, NITs, and IIITs. The platform allows students across the country, particularly in remote areas, to access interactive simulations and perform experiments online, free of cost. This initiative aims to provide equal access to quality laboratory education, foster curiosity, and support outcomes-based learning aligned with Indian curricula like AICTE and state university regulations.

Virtual labs offer deeper understanding by simulating real-world engineering experiments and concepts in a safe, cost-effective, and interactive environment. Here's how they help deepen learning, especially for Mechanical Engineering students.

Benefits of Virtual Labs for Deeper Understanding the concepts for slow and fast learners

Benefits of Virtual Labs for Deeper Understanding

Features	How It Helps
Concept Clarity	Visualizes complex theories like vibrations, kinematics, control systems, and thermodynamics.
Repeatable Experiments	Students can retry experiments multiple times until they understand the concept fully.
Hands-on Simulations	Mimics real instruments, machinery, and data logging tools (e.g., governors, flywheels, SEM/TEM).
Error-Free Learning	Safe space to make mistakes without wasting material or risking injury.

Accessible Anytime	Supports distance learning and revision beyond class hours.
Bridges Theory & Practice	Reinforces classroom concepts with real-world simulation.

S.No	Experiment Title	Link	Theory Course(s)	Laboratory Course(s)
1.	Dynamics analysis of Four-bar mechanism	Link	ME3391: Kinematics of Machinery	ME3381: Kinematics and Dynamics Laboratory
2.	Dynamics analysis of Slider-crank mechanism	Link	ME3391: Kinematics of Machinery	ME3381: Kinematics and Dynamics Laboratory
3.	Proell Governor	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
4.	Porter Governor	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
5.	Hartnell Governor	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
6.	Balancing of multiple masses in a single plane	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
7.	Balancing of multiple masses in multiple planes	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
8.	Disc Type Flywheel	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
9.	Rim Type Flywheel	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
10.	Basics of Scanning Electron Microscopy: Secondary Electron and BSE imaging mode	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
11.	Feature Size Measurement: Porosity, Grain, and Reinforcement	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
12.	Effect of Beam Voltage on Conducting and Insulating Samples	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
13.	Elemental Mapping: Spot, Line, and Area Analysis	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and

				Engineering Laboratory
14.	Basic Operations of Transmission Electron Microscope (Imaging and Diffraction)	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
15.	Bright Field Imaging and Dark Field Imaging	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
16.	Electron Diffraction for Various Materials	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
17.	Indexing of Diffraction Patterns (Ring Pattern & Spot Pattern)	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
18.	Sample Preparation for TEM Analysis (Bulk Metal, Powder Sample, Brittle Material)	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
19.	Cross-sectional Sample Preparation	Link	ME3391: Engineering Materials and Metallurgy	ME3381: Materials Science and Engineering Laboratory
20.	Engineering Graphics Lab	Link	GE3151: Engineering Graphics	-
21.	FAB Lab	Link	ME3251: Manufacturing Processes	ME3261: Manufacturing Technology Laboratory
22.	Instrumentation and Control Lab	Link	ME3351: Instrumentation and Control Systems	ME3361: Instrumentation and Control Systems Laboratory
23.	Kinematics and Dynamics of Mechanisms Lab	Link	ME3391: Kinematics of Machinery	ME3381: Kinematics and Dynamics Laboratory
24.	Machine Dynamics and Mechanical Vibrations Lab	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
25.	Material Response to Stimuli Lab	Link	ME3393: Engineering Materials and Metallurgy	ME3382: Materials Science and Engineering Laboratory

26.	Mechanics of Machines Lab I	Link	ME3391: Kinematics of Machinery	ME3381: Kinematics and Dynamics Laboratory
27.	Mechanics of Machines Lab II	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
28.	Mechanisms and Robotics Lab	Link	ME3391: Kinematics of Machinery ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
29.	Micromachining Lab	Link	ME3251: Manufacturing Processes	ME3261: Manufacturing Technology Laboratory
30.	Sensors and Instrumentation Lab	Link	ME3351: Instrumentation and Control Systems	-
31.	Vibration and Acoustics Lab	Link	ME3392: Dynamics of Machinery	ME3381: Kinematics and Dynamics Laboratory
32.	Simulation of Pre-processing for 3D Printing	Link	ME3393: Manufacturing Processes (Theory)	-
33.	Simulation of Anatomy of 3D Printer	Link	ME3791: Mechatronics and IoT (Theory)	-
34.	Simulation of Cartesian 3D Printer Machine	Link	ME3791: Mechatronics and IoT (Theory)	-
35.	Simulation of Stereolithography Process	Link	ME3393: Manufacturing Processes (Theory)	-
36.	Simulation of Fused Deposition Modelling (FDM) Process	Link	ME3393: Manufacturing Processes (Theory)	-
37.	Simulation of Delta 3D Printer Machine	Link	ME3791: Mechatronics and IoT (Theory)	-
38.	Simulation of Powder Binding / Jetting Process	Link	ME3393: Manufacturing Processes (Theory)	-