FLUID MECHANICS AND FLUID MACHINERY LABORATORY

Introduction

This laboratory provides hands-on exposure to fundamental principles of fluid mechanics and hydraulic machines. It is equipped with flow measurement devices such as Venturi meters, orifice meters, notches, and weirs, along with various pump setups. The lab enables students to visualize fluid flow behaviour and understand the working of hydraulic systems through experimentation.

Objectives

- To correlate theoretical concepts of fluid mechanics with real-time experimental observations.
- To develop proficiency in standard fluid measurement techniques and instrumentation.
- To conduct experiments and analyse fluid flow behaviour systematically.
- To enhance skills in data collection, interpretation, and report preparation.
- To promote teamwork and professional laboratory practices.

Scope

- Understanding fluid properties and flow characteristics.
- Determining discharge and flow coefficients.
- Evaluating performance and efficiency of pumps and turbines.
- Studying frictional losses in pipes and flow systems.
- Analyzing hydraulic machine performance under varying conditions.

MATERIAL TESTING AND METALLURGY LABORATORY

Introduction

This laboratory focuses on understanding material behaviour, structure, and properties through experimental analysis. It provides a strong foundation in material science, enabling students to select suitable materials for engineering applications and understand their performance.

Objectives

- To impart fundamental knowledge of material properties and behaviour.
- To analyze mechanical and structural characteristics of materials.
- To understand the relationship between microstructure and properties.
- To prepare students for material selection in engineering applications.

Scope

- Evaluation of material properties for engineering applications.
- Understanding microstructural characteristics and their effects.
- Application of material science principles in design and manufacturing.
- Development of skills for material improvement and innovation.

MANUFACTURING PROCESSES LABORATORY

Introduction

The Manufacturing Processes Laboratory provides practical exposure to various manufacturing techniques such as casting, machining, forming, and CNC operations. It integrates theoretical knowledge with hands-on practice to enhance students' understanding of production systems.

Objectives

- To provide practical knowledge of manufacturing processes.
- To develop skills in operating machine tools and equipment.
- To conduct experiments and interpret manufacturing data.
- To enhance problem-solving and engineering judgment skills.
- To promote teamwork and effective documentation practices.

Scope

- Study of machining operations such as turning, milling, drilling, and grinding.
- Understanding of casting and moulding techniques.
- Exposure to CNC programming and modern manufacturing systems.
- Evaluation of process parameters and product quality.

THERMAL ENGINEERING LABORATORY

Introduction

This laboratory deals with energy conversion systems, including internal combustion engines, refrigeration, air conditioning, and heat transfer. It provides practical insights into thermal systems and their real-world applications.

Objectives

- To understand the working principles of thermal systems.
- To analyse performance characteristics of IC engines and refrigeration systems.
- To study heat transfer mechanisms experimentally.
- To evaluate efficiency and performance of thermal devices.

Scope

- Understanding the working and performance of IC engines.
- Studying refrigeration and air conditioning systems.
- Learning different heat transfer methods through experiments.
- Evaluating the efficiency of thermal engineering devices.

DYNAMICS OF MACHINERY LABORATORY

Introduction

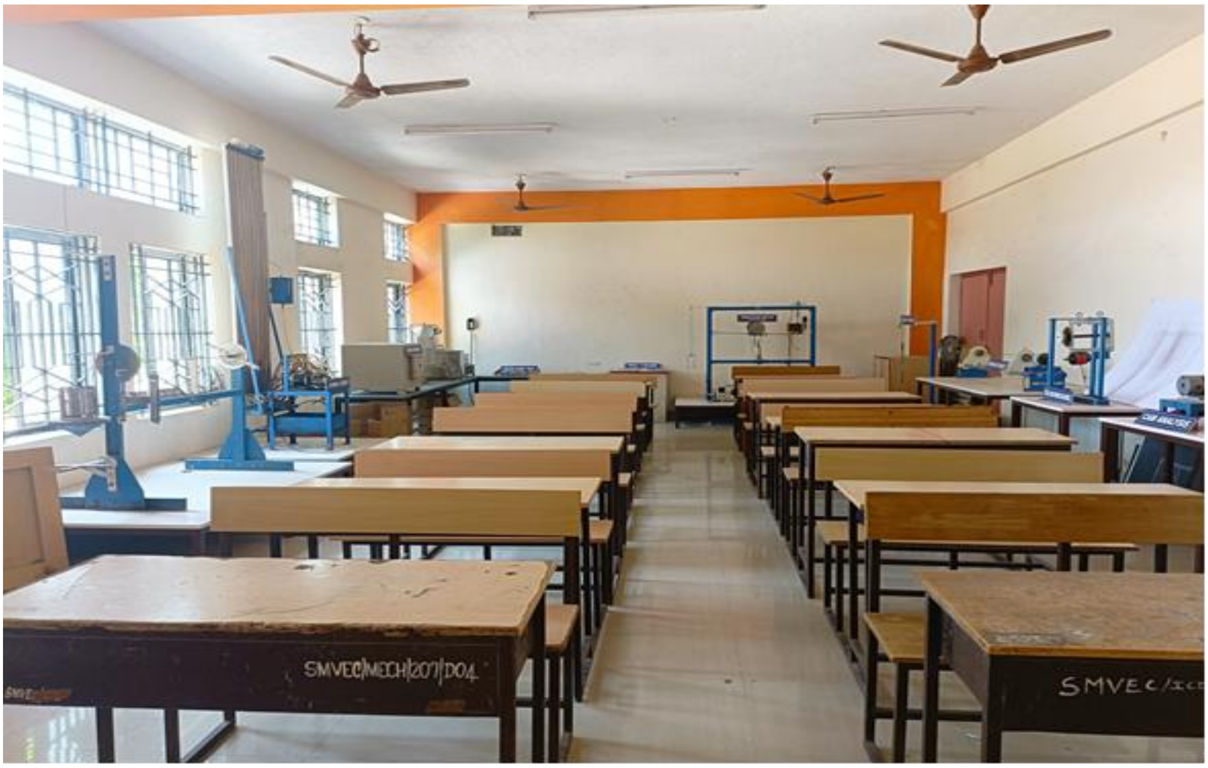
This laboratory focuses on the analysis of machine motion and dynamic forces. It provides practical understanding of mechanisms, vibrations, balancing, and dynamic behaviour of machines.

Objectives

- To analyse dynamic forces in machine components.
- To study balancing and vibration characteristics.
- To understand motion analysis of mechanisms.
- To evaluate dynamic performance of mechanical systems.

Scope

- Study of kinematic mechanisms and inversions.
- Determination of moment of inertia and balancing of rotating systems.
- Analysis of vibrations and damping characteristics.
- Application of dynamics in machine design.



MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY

Introduction

This laboratory provides practical knowledge of measurement techniques, instruments, and calibration methods. It emphasizes precision engineering and quality control practices.

Objectives

- To understand principles of measurement and instrumentation.
- To develop skills in calibration and error analysis.
- To study limits, fits, and tolerances.
- To familiarize with transducers and modern measurement systems.

Scope

- Measurement of physical parameters such as force, temperature, and pressure.
- Use of precision instruments for dimensional measurement.
- Analysis and evaluation of measurement data.
- Application of metrology in industrial quality control.

CAD / CAM LABORATORY

Introduction

The CAD/CAM Laboratory enables students to design, analyze, and manufacture products using modern software tools. It integrates design, simulation, and manufacturing in a digital environment.

Objectives

- To develop skills in 2D drafting and 3D modelling.
- To understand design analysis and simulation techniques.
- To learn CNC programming and automation concepts.
- To apply CAD/CAM tools in real-world engineering problems.

Scope

- Stress and strain analysis using simulation tools.
- Application of failure theories in design.
- CNC programming and machining operations.
- Product development and rapid prototyping.

MODROB LABORATORY

Introduction

A MODROB Laboratory is an advanced engineering laboratory established to support education, research, and innovation in the field of robotics and automation. The laboratory provides hands-on training in the design, development, programming, and control of modular robotic systems used in modern industries

Objectives

- To provide practical knowledge in the field of robotics and industrial automation.
- To develop students' understanding of robotic systems, mechanisms, and control techniques.
- To train students in robot programming, simulation, and operation of robotic manipulators.
- To provide hands-on experience in automation technologies used in modern industries.

Scope

- Robotic System Design and Development
- Industrial Automation Applications
- Robot Programming and Simulation.
- Integration of Sensors and Actuators.

Tensile Testing Machine

Micro Vickers hardness tester

Digital Fatigue Testing Machine

PRODUCT DESIGN AND DEVELOPMENT LABORATORY

Introduction

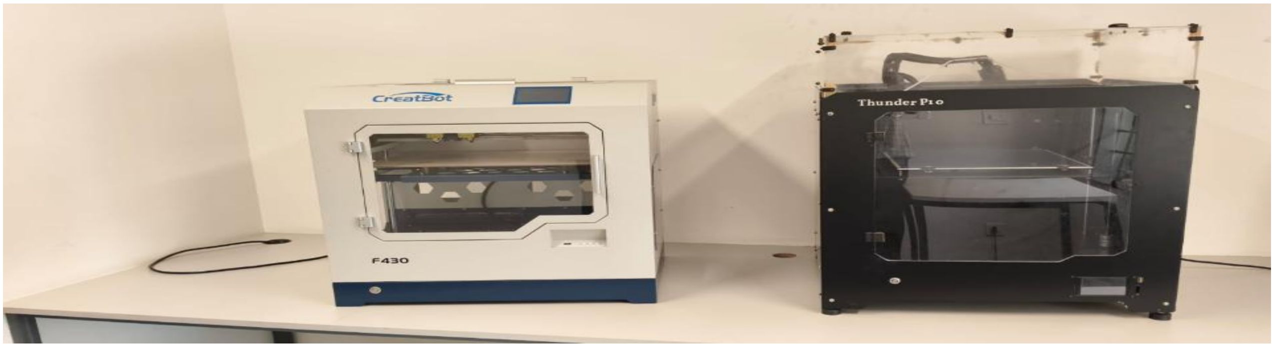
The **Product Design and Development Laboratory** is an important facility established to provide practical knowledge and technical skills related to product innovation, design, analysis, prototyping, and manufacturing. The laboratory helps students understand the complete process involved in transforming an idea or concept into a finished product that satisfies customer needs and industrial requirements.

Objectives

- To provide practical knowledge in product design, development, and manufacturing processes.
- To develop students' skills in creative thinking, innovation, and problem-solving for product development.
- To train students in the use of modern CAD/CAM and product modelling software tools.
- To provide hands-on experience in conceptual design, engineering drawing, and prototype development.
- To understand the principles of product planning, material selection, ergonomics, and design optimization.

Scope

- Conceptual Product Design
- Product Analysis and Simulation
- Rapid Prototyping and Additive Manufacturing
- Material Selection and Manufacturing Processes



CNC WOOD ROUTER

Laser cutting Machine

FESTO HYDRAULIC LABORATORY

Introduction

. The **FESTO Laboratory** is an advanced training and research laboratory established to provide practical knowledge in the fields of industrial automation, pneumatics, electro-pneumatics, hydraulics, programmable logic controllers (PLC), mechatronics, and robotic systems. The laboratory is designed to enhance students' technical skills and industrial readiness through hands-on experiments and real-time automation applications.

Objectives

- To train students in the design, operation, and control of pneumatic and hydraulic circuits.
- To provide hands-on experience in PLC programming, sensors, actuators, and industrial control systems.
- To enhance knowledge of mechatronics systems and integration of mechanical, electrical, and electronic components.
- To familiarize students with industrial automation equipment and FESTO training modules.
- To bridge the gap between theoretical concepts and industrial automation practices.
- To develop troubleshooting, analytical, and problem-solving skills through practical experiments..

Scope

- Pneumatic and Hydraulic Systems
- Electro-Pneumatics and Electro-Hydraulics
- Programmable Logic Controller (PLC) Applications
- Mechatronics System Integration

ABB ROBOTICS AND AUTOMATION LABORATORY

Introduction

. The ABB Robotics and Automation Laboratory is an advanced learning and research facility established to provide students with practical exposure to industrial robotics, automation systems, and smart manufacturing technologies. The laboratory is equipped with ABB industrial robotic systems, robotic programming tools, sensors, controllers, and automation modules that enable students to understand modern manufacturing practices. The lab bridges theoretical concepts with real-world industrial applications, helping students develop skills in robotic operations, automation integration, and intelligent production systems.

Objectives

- To provide hands-on training in industrial robotics and automation technologies.
- To familiarize students with ABB robot programming, operation, and control systems.
- To develop practical knowledge in robotic movement, path planning, and automation processes.
- To enhance student understanding of sensors, actuators, controllers, and integrated manufacturing systems.
- To promote research and innovation in robotics, Industry 4.0, and smart manufacturing applications.
- To strengthen industry-oriented skills required for modern automated industries.
- To support project development, interdisciplinary learning, and industrial consultancy activities.

Scope

- The ABB Robotics and Automation Laboratory offers extensive opportunities in education, research, and industrial applications, including:
- Industrial robot programming and simulation.
- Pick-and-place operations and material handling systems.
- Assembly line automation and process control.
- Sensor integration and machine vision applications.
- PLC and robotic system interfacing.
- Industry 4.0, IoT, and smart factory applications.

- Research in autonomous systems and intelligent manufacturing.

ABB ROBOTIC CELL