Department of Electrical & Electronics Engineering Education: Major Facilities

Contents

The department houses several state-of-the-art laboratories, advanced software (MATLAB, Cadence, PSIM etc.) and Centres of Excellence (CoE) that support hands-on training, interdisciplinary research, and product development. Notable among these are:

- **Semiconductor Technology & Packaging Centre (STPC)**
- **CoE-OSAT (Outsourced Semiconductor Assembly and Test) Lab**
- **VLSI Design Lab**
- **Digital Communication Lab**
- **Mechatronics Lab**
- **Process Instrumentation Lab**
- **Electrical and Energy Studies Lab**
- **Renewable Energy Lab**
- **Drone Flight Simulator Lab**
- **Software Engineering Lab**
- **Upcoming Electric Vehicle Lab**

Upcoming Semiconductor Technology & Packaging Centre [STPC]

The upcoming Semiconductor Technology and Packaging Centre (STPC) at NITTTR Bhopal will stand as a comprehensive hub for advancing India's capabilities in the semiconductor domain by integrating three critical pillars of the industry: VLSI Design, Semiconductor Fabrication, and Semiconductor Packaging. Through its structured Degree/Diploma/Ph. D. and training programs, STPC offers deep insights into VLSI design, covering logic design, layout, verification, and design automation tools. Simultaneously, the center is expanding its scope to include semiconductor fabrication, exposing learners to essential cleanroom protocols, wafer processing techniques, and device physics fundamentals. The cornerstone of STPC's expertise remains semiconductor packaging—especially OSAT and ATMP processes—ensuring learners gain hands-on skills in assembly, testing, and reliability assessment. By embedding these three core competencies, NITTTR Bhopal will be nurturing a skilled workforce and supporting India's vision to become self-reliant and globally competitive in the semiconductor sector.

CoE-OSAT (Outsourced Semiconductor Assembly and Test) Lab

A specialized lab aimed at addressing the growing need for semiconductor packaging and assembly skillsets in India’s emerging electronics manufacturing ecosystem. It supports training in semiconductor packaging, testing, and reliability analysis in collaboration with industry partners. Equipped with major equipment’s like Laminar Flows, Die Bonder, Wire Bonder, Screen printer, Probe-Station, Dicing Machine, Oven, High Temperature furnace, and various types of wafers etc.

Batch production of 16 pin DIP

Package (inner view)

Package (attached to connector)

Demonstration of packaging

Package developed for Naina Semiconductors

VLSI Design Lab

The VLSI Design Lab is equipped with advanced tools and infrastructure to support the design, simulation, and verification of integrated circuits. Key features include: Industry-standard platforms such as **Cadence Design Suite** and **Xilinx ISE/Vivado** for front-end and back-end VLSI design, FPGA development, and digital system modeling. High-end **workstations and PCs** capable of handling compute-intensive simulations and design tasks, ensuring a smooth and efficient workflow for students and researchers. This lab supports practical learning, project development, and research in modern semiconductor design and digital electronics.

Mechatronics Lab

Mechatronics is the fundamental building block for pioneering initiatives in multiple engineering disciplines, which are major enablers of Industry 4.0. This lab provides a platform to foster knowledge and working experience of synergistic integration of diverse engineering disciplines amongst the individuals so as to equip them with industry ready skills.

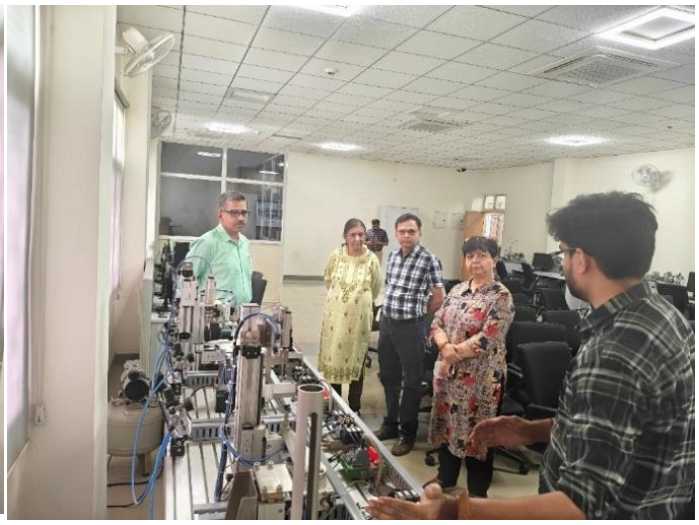
Key Functionality

- Advanced mechatronics modular systems and specially compiled with Siemens S7 kit.
- Hands-on learning on working and programmeming of mechatronics modular systems
- Troubleshooting with interpretation of process circuit diagrams and datasheets
- Development of projects and conducting research based on real-time industrial problems

Facilities

This lab comprises of advanced mechatronics modular stations specially compiled with Siemens kit: Distribution Station Testing Station Processing Station Buffering Station Sorting Station.


SIEMENS




SIEMENS

Process Instrumentation Lab

Process Instrumentation is comprised of the sensors and various instruments to monitor and maintain process control equipments for improved production, product consistency, quality management and workplace safety in manufacturing and processing facilities. The major focus of the lab is on the application of electronics and associated technology to instrumentation, industrial automation, process control systems and commonly used sensors.

Key Functionality

- Imparts skills & knowledge on complete Process Automation & Process Instrumentation in all types of Process Industries.
- Provides knowledge on Distributed Control Systems & Configuration, Measuring Technologies for Pressure, Temperature, Level & Flow and Valve Positioning etc.
- Hands-on experience of different processes and their measurements
- Real time measurement and control of process variables such as levels, flow, pressure, temperature, pH and humidity
- Project based learning on alarm management, process safety and asset management
- Forum for research, project development and deployment activities in instrumentation engineering

Facilities

PCS7 / SIMIT SIMATIC PCS & & Process Transmitters Racks with Pressure Transmitters, Temperature Transmitter, Level Transmitter (RADAR, Ultrasonic & Capacitive), Flow Transmitters (Electro-magnetic, Coriolis Mass flow, Ultrasonic) & Electro-pneumatic Valve Positioner. Process Instrumentation set consists of pressure, Temperature, Flow & Level measurement Instruments, Valve Positioner with actuator

Electrical and Energy Studies Lab

Energy efficient electrical systems have always been the priority for industries across the verticals. The knowledge on high performance equipments, high standard protective instruments and the best industry practices for energy conservation contribute significantly to facility management and facility engineering. This lab offers the opportunity to make in-depth study of the Industrial equipments and explore energy efficient strategies that can be deployed in the industries to deliver customized consulting and market specific solutions.

Key Functionality

- Hands-on learning on industrial AC-DC drives, industrial switchgear, parameterization, motor maintenance/servicing
- Ability to create diagnostic & troubleshooting strategies
- System that automatically processes the electrical energy consumption and visualizes it in real time
- Development of projects and conducting research based on real-time industrial problems in energy management

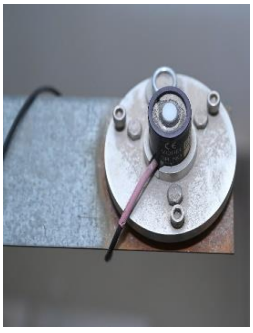
Facilities

DC Drive Training Equipment with SINAMICS DC Master 6RA80 AC Drive Training Equipment with SINAMICS G120 SERVO Drive Training Equipment with SINAMICS S120 LV-Switchgear Training Equipment setup SIMOCODE (Intelligent Motor Management System) PAC Meter-Energy Meters Energy Saving Training Equipment

Renewable Energy Lab

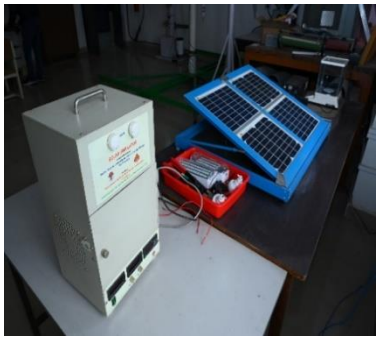
Our state-of-the-art Renewable Energy Labs are fully equipped with a diverse range of horizontal and vertical axis wind turbines, ranging from 10 watts to 400 watts. The facilities also include advanced wind masts, solar simulators, and other essential equipment to support cutting-edge research and hands-on learning in sustainable energy technologies. Solar Photo voltaic training and research trainer Solar PV lab trainers, Renewable (Wind) Energy Laboratory Equipment etc.










Drone Flight Simulator Lab

The Drone Flight Simulator Lab is equipped with state-of-the-art hardware and software to provide an immersive and hands-on learning experience in drone operation and racing.
The lab features the DRL Simulator, a professional-grade drone flying and racing simulator used by the Drone Racing League. It offers realistic physics, customizable drones, DRL gaming modes, access to DRL Academy content, virtual labs, and a highly immersive training environment. The simulator supports 12 users simultaneously.
Each simulation station is equipped with a 2.4 GHz 6-channel RC Transmitter (Flysky), including transmitters, receivers, and dongle-based firmware integration. A total of 12 transmitter sets are available to support multi-user training sessions.

Software Engineering Lab

The Software Engineering Lab is equipped with high-performance systems and the latest software tools (MATLAB, SIMULINK, MULTISIM, ULTIBOARD, PSIM, LABVIEW, ETAP, CASPOC, PSCAD, MiPOWER, Electrical Expert (IGE+XAO)) Electronic Work bench (Computer based), Electronic lab simulator, Electronic Work bench Version 5 (Computer based), Electronic lab simulator, to support simulation, programming, data analysis, and design tasks. It provides students and researchers with access to industry-standard platforms for engineering, renewable energy modeling, and other technical applications, fostering practical skills and innovation.

Power System and Electrical Machine Lab

Power System and Electrical Machine Lab is equipped with:

- Buchholz Relay setup for Transformer
- Synchronous Motor Generator Setup with control panel and load bank
- Simulation Model for protection consisting of a Motor generator (alternator) set
    - Microcontroller and microprocessor base various protective relays
    - Testing panel
- Speed control (V/F control) of three phase ac induction motor
- Three Phase fault analysis trainer
- Trainer for determination of positive, negative and zero sequence impedance of an alternator
- Microcontroller base slip ring Induction motor speed control using static Kramer drive
- Speed Control of DC shunt motor using three phases fully control converter
- Transformer protection simulation panel
- Transmission line simulation unit (400 KM)
    - Differential relay training system,
    - Earth fault relay training system
- Multifunction 9 in 1 test lab equipment, model-4049 Aplab make
- Instantaneous Over current Relay, Static type over voltage relay set, oil Test0-60 KVA motorized type

Upcoming Electric vehicle Lab

The Upcoming Electric Vehicle (EV) Laboratory is a cutting-edge facility dedicated to advancing education, training, research, and innovation in the field of electric mobility. This lab aims to support the Government of India's mission of clean transportation, decarbonization, and promotion of indigenous EV technologies under the FAME India Scheme, National Electric Mobility Mission, and Net Zero Emission Targets.

In addition to these advanced labs, the department offers a robust academic portfolio to nurture the next generation of engineers, researchers, and technologists