

Department of Mechanical Engineering NITTTR, Chandigarh



Vision

To be a centre of excellence in Mechanical Engineering with focus on Manufacturing Technology.

Mission

1. To offer education and training programs in the area of Mechanical Engineering for faculty of technical institutions and working professionals.
2. To undertake research & development in emerging areas in manufacturing technology for enhancing global competitiveness of industry.
3. To provide extension and consultancy services to technical education system and industry.
4. To develop need based curricula and corresponding instructional material to enhance the learning outcomes.

Department Faculty

S. S. Dhami, Ph.D.
Professor & Head



B. S. Pabla, Ph.D.
Professor



S. S. Banwait, Ph.D.
Professor



Rupinder Singh, Ph.D.
Professor



S. D. Jassal, M.E.
Associate Professor



P. S. Rao, Ph.D.
Assistant Professor



PRESENT ACTIVITIES

- **STAFF DEVELOPMENT**

- Short Term Courses
- Masters Programs
 - M.E. Mechanical Engineering (Manufacturing Technology)
 - ❖ Regular and Modular
 - M.E. Mechanical Engineering (Robotics)
 - ❖ Regular
- Ph.D. Program

- **RESEARCH & DEVELOPMENT**

- Ph.D. Program
- Industry-Institute-R&D Organization Collaboration
- International and National Conferences

PRESENT ACTIVITIES (Contd.)

- **EXTENSION SERVICES & CONSULTANCY**
 - Assistance to national and state bodies i.e. AICTE, NBA, MoE, CSIR Labs, Universities, State Boards of Technical Education
 - Material Testing facilities to industry and research scholars from other technical institutions
 - Conducting recruitment tests for various state agencies
- **CURRICULUM DEVELOPMENT**
 - Curriculum development and updation for Mechanical Engineering PG programs
 - Expert guidance for curriculum development to various Universities and State Boards
- **INSTRUCTIONAL MATERIAL DEVELOPMENT**

Short Term Courses

Thrust Areas

- Additive Manufacturing (Metal/ Polymer and Bio printing)
- Waste Management and Recycling
- Bio-medical Applications
- Advanced Manufacturing & Hybrid Machining
- Computer Aided Design & Manufacturing
- Computer based Production Management
- Mechatronics
- Robotics & Automation
- Optimization Techniques
- Modeling & Simulation
- Material Characterization, Testing – Destructive and NDT
- Metrology, Inspection & Quality Control
- Conventional Machining & Maintenance of Machine tools

Salient Features of M.E. Programs

- Up-to-date Curriculum, Extensive Laboratory Work
- Industrial Visits
- Industry sponsored thesis work
- Lectures by Industry/Outside Experts
- Provision of MOOCs and Online Courses
- Collaborative thesis work with industry & other institutes
- Mandatory Research Publications by ME students
- Plagiarism Policy as per UGC Guidelines



Major Subjects in PG Programs: Manufacturing Technology and Robotics

- Digital Manufacturing
- Rapid Manufacturing
- Computer Based Production Management
- Industrial Automation & Control
- Mechatronics Systems
- Industrial IoT
- Machine Learning
- Big Data Analytics
- Optimization Techniques
- Research Methodology

Major Industry Visits

- Maruti Udyog Limited, Gurugram
- Rail Coach Factory, Kapurthala
- Mahindra Swaraj Limited, Mohali
- HMT Limited, Pinjore
- Eicher Tractors Ltd., Parwanoo
- Eastman Cast and Forge Ltd., Ludhiana
- ASK Automotives Ltd., Manesar
- CIPET, Amritsar
- Northern Railway Mechanical Workshop, Amritsar
- CSIR Labs

Collaborative M.E. thesis work: Major Industries & Organizations

- ABB India Ltd., Bangalore
- CSIR-CSIO, Chandigarh
- GADVASU Ludhiana
- IIT Roorkee & Ropar
- MNIT, Jaipur
- Berger Paints, Jammu
- Balmer Lawrie & Co. Ltd., Faridabad
- Eastman Cast and Forge Ltd., Ludhiana
- Vembsys Technovation, Gurgaon
- ASK Automotive (P) Ltd., Manesar
- Local Industries like Coatec India, JREW Engineering, Bubber Industries

Major Industries & Organizations of Experts

- SML Isuzu Ltd., S.B.S. Nagar
- Eicher Tractors Ltd., Parwanoo
- IEC Kirloskar Gensets Ltd., Jalandhar
- Medhaavi Centre for Automotive Research, Hoshiarpur
- Vembsys Technovation, Gurgaon
- Nimarta Consulting Group (P) Ltd., Mohali
- CLAAS India, Morinda
- Parametric Cadtech, Chandigarh
- R2P Technologies, Mohali
- Central Scientific Instrument Organization, Chandigarh
- Terminal Ballistic Research Laboratory, Chandigarh
- C-DAC, Mohali
- IIT, Delhi
- IIT, Chennai
- IIT, Mumbai
- IIT, Roorkee
- IIT, Ropar
- PEC, Chandigarh
- UCoE, Punjabi University, Patiala
- NIT, Hamirpur
- MNIT, Jaipur
- NIT, Jalandhar

Ph.D. Program

- Major Research Areas
 - Additive Manufacturing
 - Tool Life Enhancement
 - Surface Modification
 - Nano-Coatings
 - Prognostic Condition Monitoring
 - Engineering Optimization
 - Hybrid Manufacturing Applications
 - Reconfigurable Manufacturing Systems
 - Waste reduction and process optimization
- Industry & R&D Organizations sponsored/supported research work
- Plagiarism Policy as per UGC Guidelines
- Approved QIP Centre for Engineering & Polytechnic Faculty
- Awarded – 18 (in past 5 years)
- In Progress – 12

IPR by Faculty and Research Scholars

- A wear resistant part having metal matrix composite (MMC) and process for preparing the metal matrix composite (Ref. No./ Application No. 2847/DEL/2013, Dated 26-09-2013, Development of metal matrix composite (MMC) by two stages hybridization of fused deposition modelling (FDM) and investment casting (IC)
- A wear resistant part having metal matrix composite (MMC) and process for preparing the metal matrix composite (Ref. No./ Application No. 2848/DEL/2013, Dated 26-09-2013, Development of metal matrix composite (MMC) by hybridization of silicon moulding (SM) and investment casting (IC)
- A process for casting an article of molten metal (Ref. No./ Application No. 2474/DEL/2015, Dated 11-08-2015, Reduction in cycle time of investment casting process by hybridization of fused deposition modelling, investment casting and vacuum moulding process
- A process for casting an article of molten metal (Ref. No./ Application No. 2475/DEL/2015, Dated 11-08-2015, Combination of stir casting, vacuum moulding with ABS pattern based fiber reinforced shell of investment casting for preparing metal matrix composite

IPR by Faculty and Research Scholars (Contd.)

- Patent filed for Real Time Non Contact Vibration Measurement System for Structural Health Monitoring, Patent Filing Number 3567/DEL/2015 dated November 2, 2015.
- Personalised LPG Cylinder Handling System jointly by NITTTR, Chandigarh & MNIT, Jaipur on August 12, 2016
- MATLAB Code for Solving Multi-Level Linear Fractional Programming Problems, Application ID SV-11904/2018
- Modified ultrasonic machining process (Ref. No. Indian Patent Application No: 202011001505 dated January 13, 2020, TEMP/E-1/1644/2020-DEL.
- Smart Modular Benchvice (Application ID 327583-001 dated 27-02-2020)

Industry sponsored Simulation Centre of Excellence (SCoE)

- ABB India Limited, Bengaluru sponsored Simulation Centre of Excellence (SCoE) for simulation of Electromechanical Systems
- Funding of Rs. 165 lakh provided to procure high-end computer workstations and CAE software.
- A number of students of Mechanical Engineering and Computer Science & Engineering departments have completed their research work using said sophisticated hardware/software available in the SCoE

Projects Carried out in SCoE

Title Of The Thesis	Software / Feature Used
Design and Development of Computerised Vice for Shaped Components	ANSYS (Transient Structural) & MATLAB
Thermal and Structural Analysis of LED Cooling System	ANSYS (Steady State Thermal/CFD)
Modeling and Modal Analysis of SKF 1205 EKTN9 Ball Bearing	ANSYS (Steady State Thermal/CFD)
Analysis of Laser Forming under Forced Cooling	ANSYS / ABAQUS
Heat and Mass Transfer Modelling in Lyophilization	COMSOL (Thermal/Heat Transfer)
Structural Analysis of LV Motor Foot	ANSYS
Optimization and Modelling of Machining of Titanium Alloy by Single Point Diamond Tool	ANSYS
Condition Monitoring of Spur Gear using Infrared Thermography	MATLAB
Reduction of Weight and Vibration of Locomotive Oil Cooling Unit	ANSYS (Structural and Modal)
Classification of mammograms using various feature extraction methods and machine learning	GPU
Classification of action based video using heterogeneous feature extraction and SVM	GPU
Adversarial attack on object detection algorithm	GPU

Conferences/Seminars

- ❖ The department periodically organizes National level conferences/seminars in cutting edge technology areas for exchanging the latest research amongst academic community and industry professionals
 - Green Vehicle Technology for Cleaner Environment (2016)
 - Advances in Manufacturing Technology (2005, 2008, 2012, 2013)
 - Advances in CAD / CAM Technology (2006)
 - Mechatronics (2007)

❖ **UPCOMING EVENTS**

- National Conference as 7th series on March 25-26, 2021 ([NCAMT-2021](#))
- 12th International conference ICMPC -2021 scheduled on Oct. 6 - 9, 2021 (www.icmpc.com)

IRG

- Department provides material testing facilities to other organizations
- The laboratory facilities are also used for providing training to B.E./B.Tech. students
- Department faculty and staff is also involved in conducting recruitment tests for various government organizations leading to annual IRG contribution to the tune of Rs. 2.0 crore

Strengths of Department

- Highly dedicated faculty with average 20 years of exposure (Industry and Research) at national and international levels
- Highly decorated faculty members with edge in research and citations (H index above 30 as per Scopus)
- Positioning of faculty in recently published list of top 2% scientists in India based upon Stanford University survey report
- Faculty with good number of research publications, books, monographs

Strengths of Department (Contd.)

- Expertise in conducting Online Programs
- Continual upgradation of faculty through international & national conferences and training programs
- Exposure in filing product and process patents, technology transfer
- Faculty contribution in national & state level bodies
- State of Art facilities for Advanced Manufacturing, Additive Manufacturing, Material Characterization, CAD/CAM and Mechatronics & Automation

Strengths of Department (Contd.)

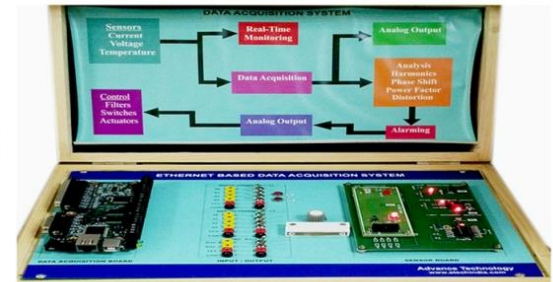
- Industry sponsored Laboratory and Projects
- Collaborative research initiatives
- Exposure in handling Government / Industry sponsored research projects
- Pan India Students
- Flexible system to adopt and practice NEP-2020
- Regular hosting of National / International conferences & seminars
- Encouragement & guidance to students for entrepreneurial activities
- Strong Alumni Interaction

Strengths of Department (Contd.):

Major Funded Projects

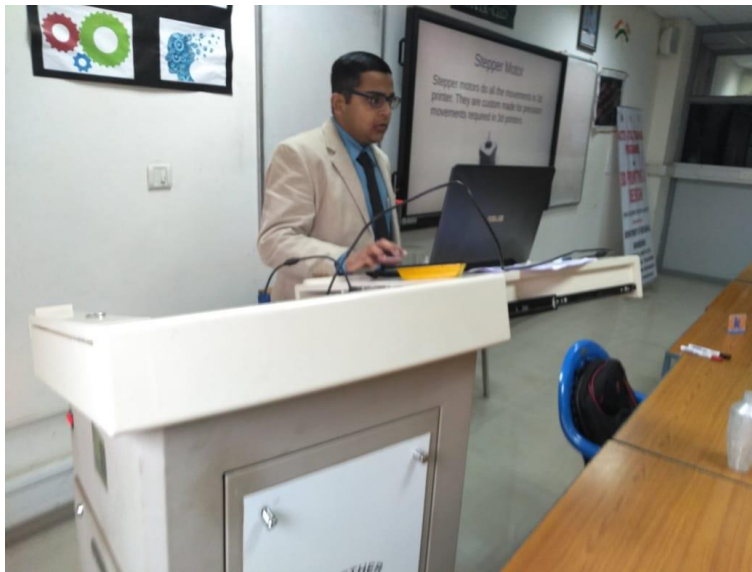
- AICTE-RPS on Cutting Tool Life Enhancement using Nano-Composite Coatings
- Induction Training Programs for newly recruited Assistant Engineers of Punjab State Transmission Corporation Limited
- Upgradation of Laboratory Infrastructure under TEQIP-II
- Establishment of Simulation Centre of Excellence sponsored by ABB India Ltd., Bengaluru
- Structural Analysis of LV Motor Foot for ABB Limited, Faridabad

Strengths of Department (Contd.): Department Infrastructure





MODERN CLASSROOMS



- Digital Displays
- Digital Projectors
- Digital Podiums



Laboratories



ADDITIVE MANUFACTURING

Metal Additive Manufacturing Setup



2019/7/17 0

Rapid Prototyping Machine (ABS Polymer based)



Bio-Printer



Laboratories



ADVANCED MANUFACTURING

Flexible Manufacturing System



CNC Vertical Milling Centre



CNC Turning & Milling Simulators



Electro-Chemical Machining



Electric Discharge Machine

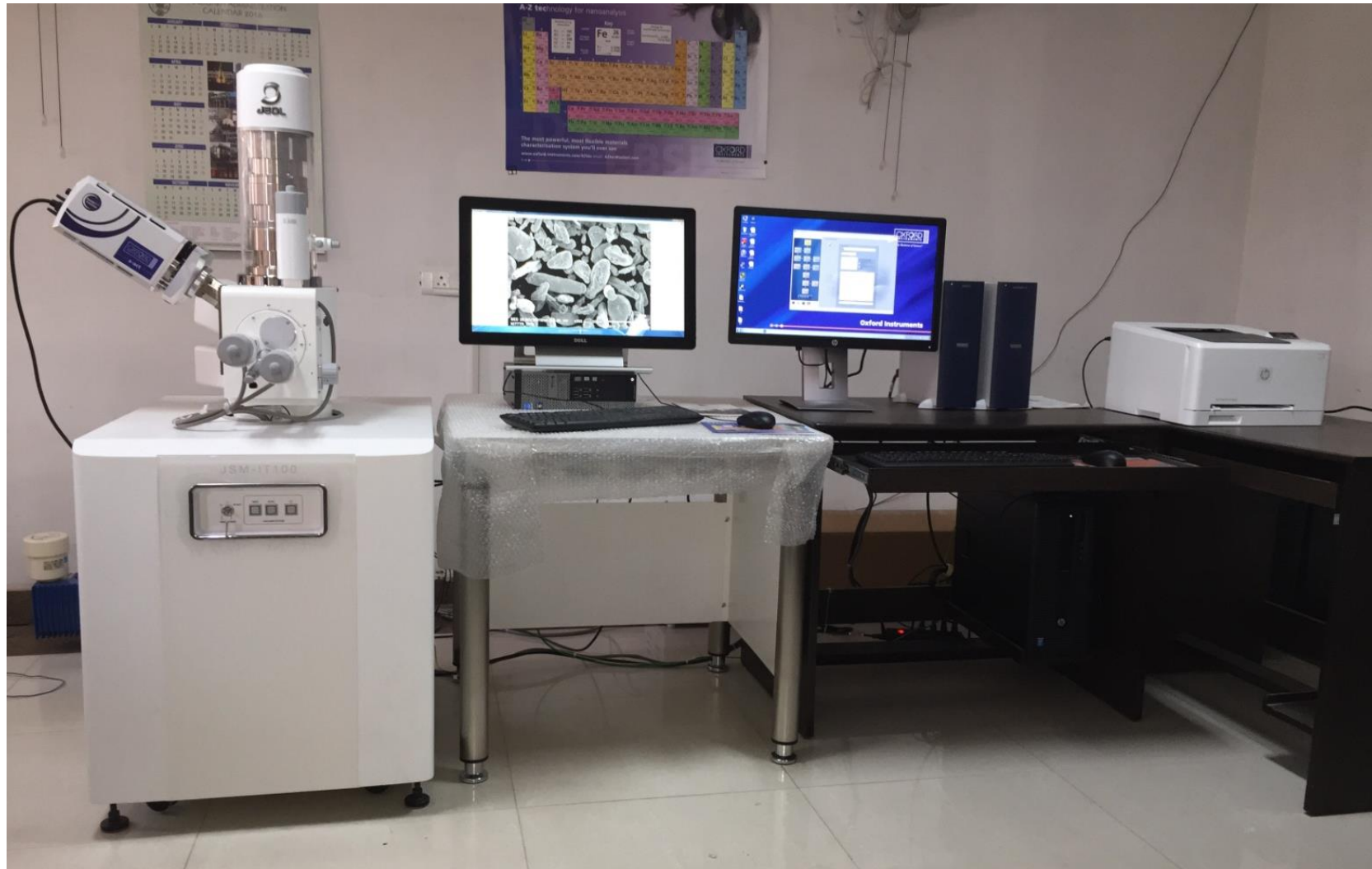


Laboratories



MATERIAL CHARACTERIZATION

Scanning Electron Microscope (SEM) with EDX



Optical Emission Spectrometer



Machine Vision system



Micro Hardness Tester



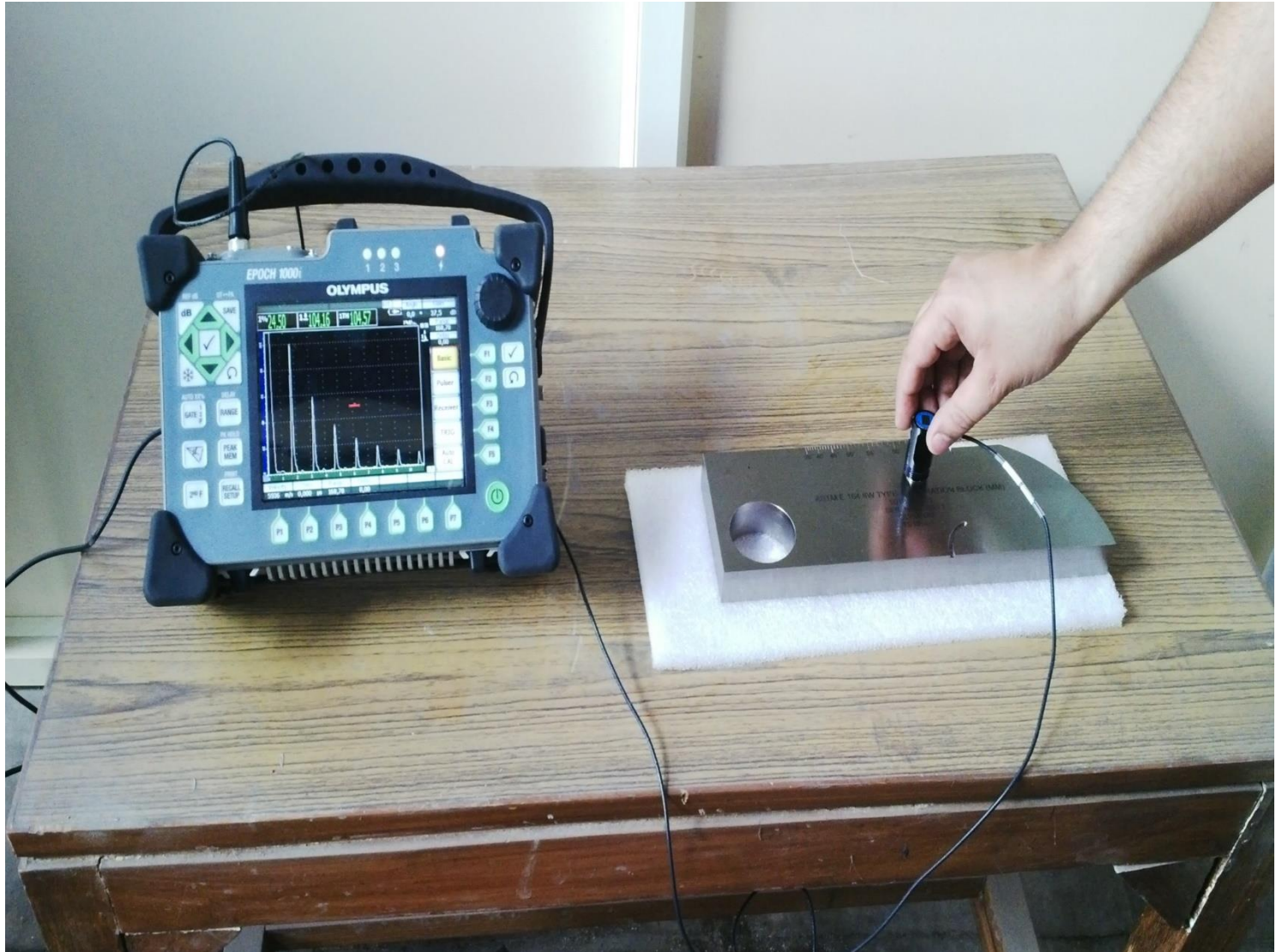
Digital Hardness Tester



Surface Roughness Tester



Ultrasonic Flaw Detector



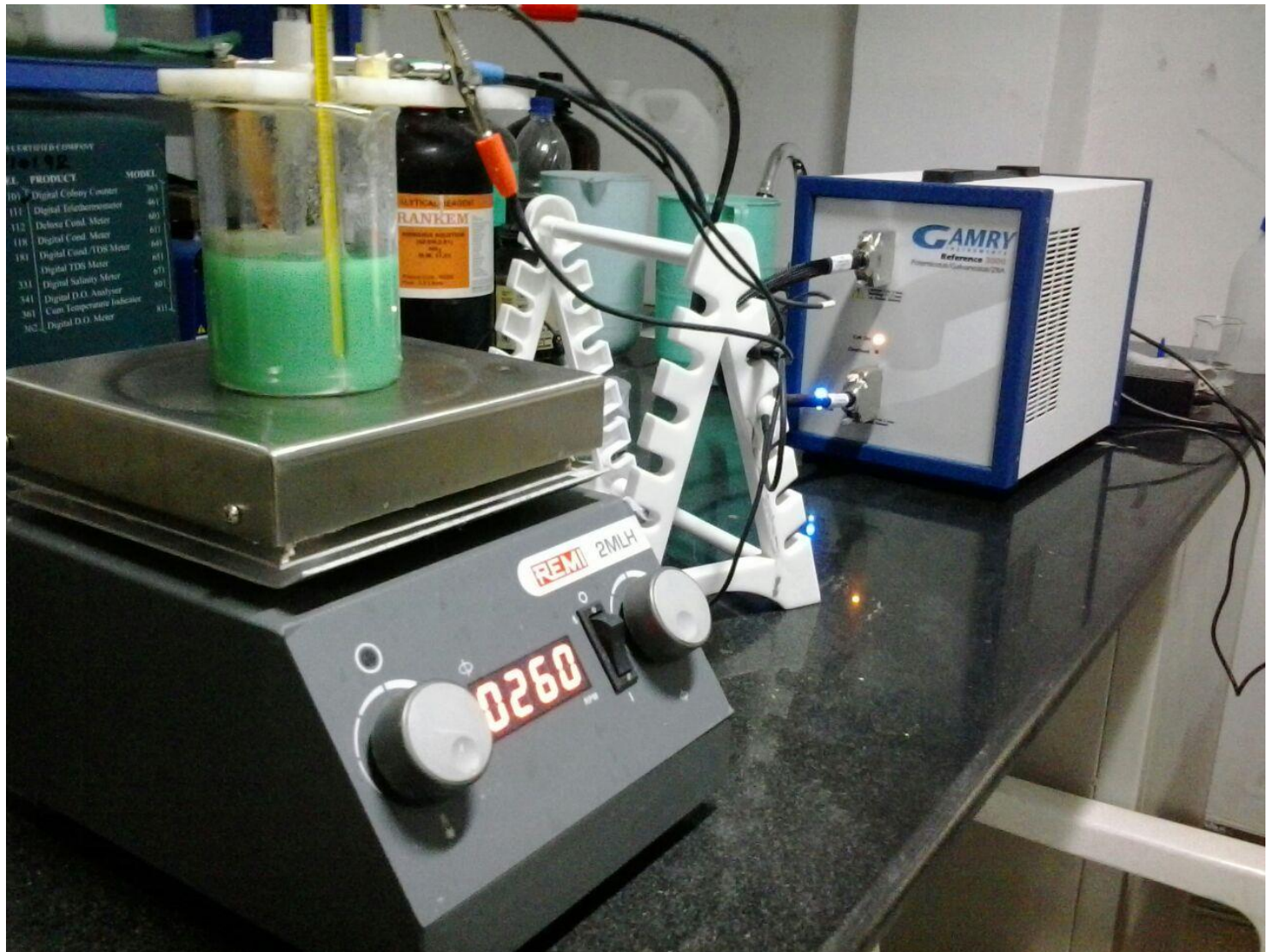
PC based Sliding Wear Test Rig



Cryogenic Treatment Setup



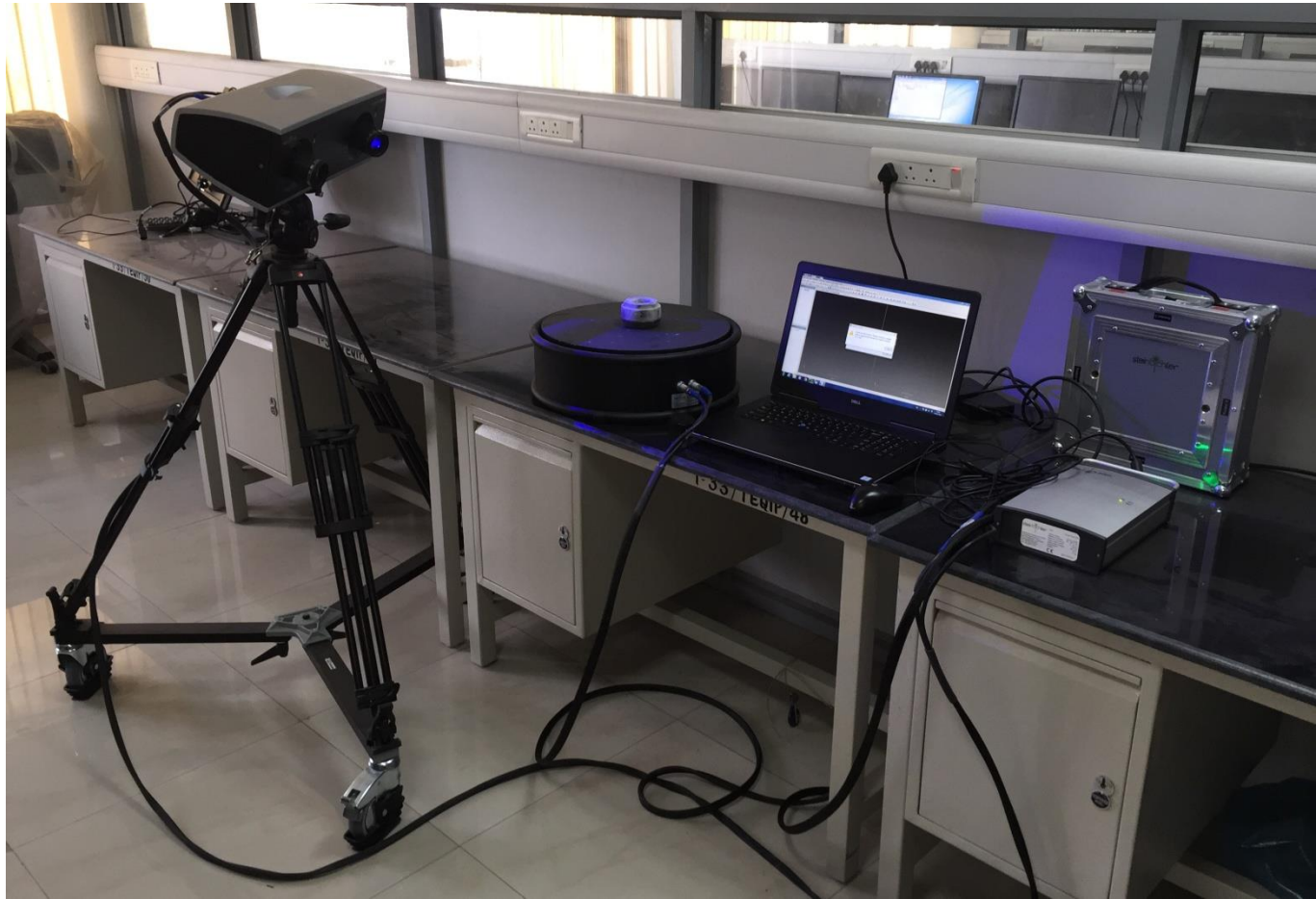
Potentiostat / Galvanostat



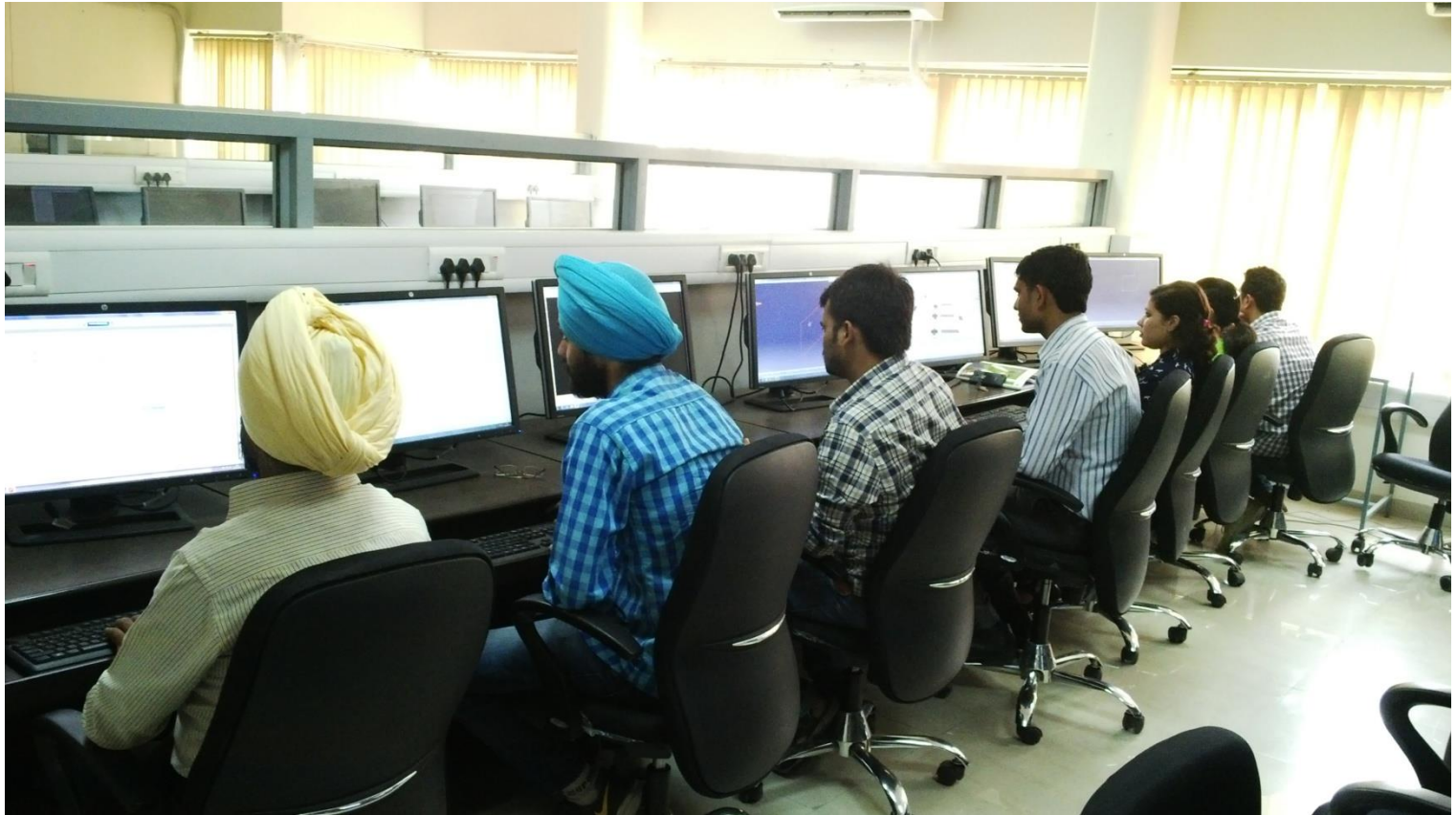
Laboratories

° **REVERSE ENGINEERING
& CAD**

3-D Scanner



CAD Workstations



Major CAE / Modeling Software

ANSYS Suite

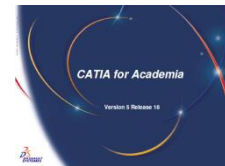


COMSOL



ADSTEFAN

CATIA



Delmia



Creo



Major CAE / Modeling Software (Contd.)

MDT & Autodesk Inventor



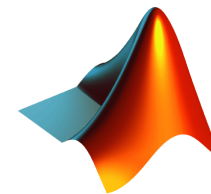
Simufact



KissSoft



MATLAB



Automation Studio



Laboratories



CONDITION MONITORING

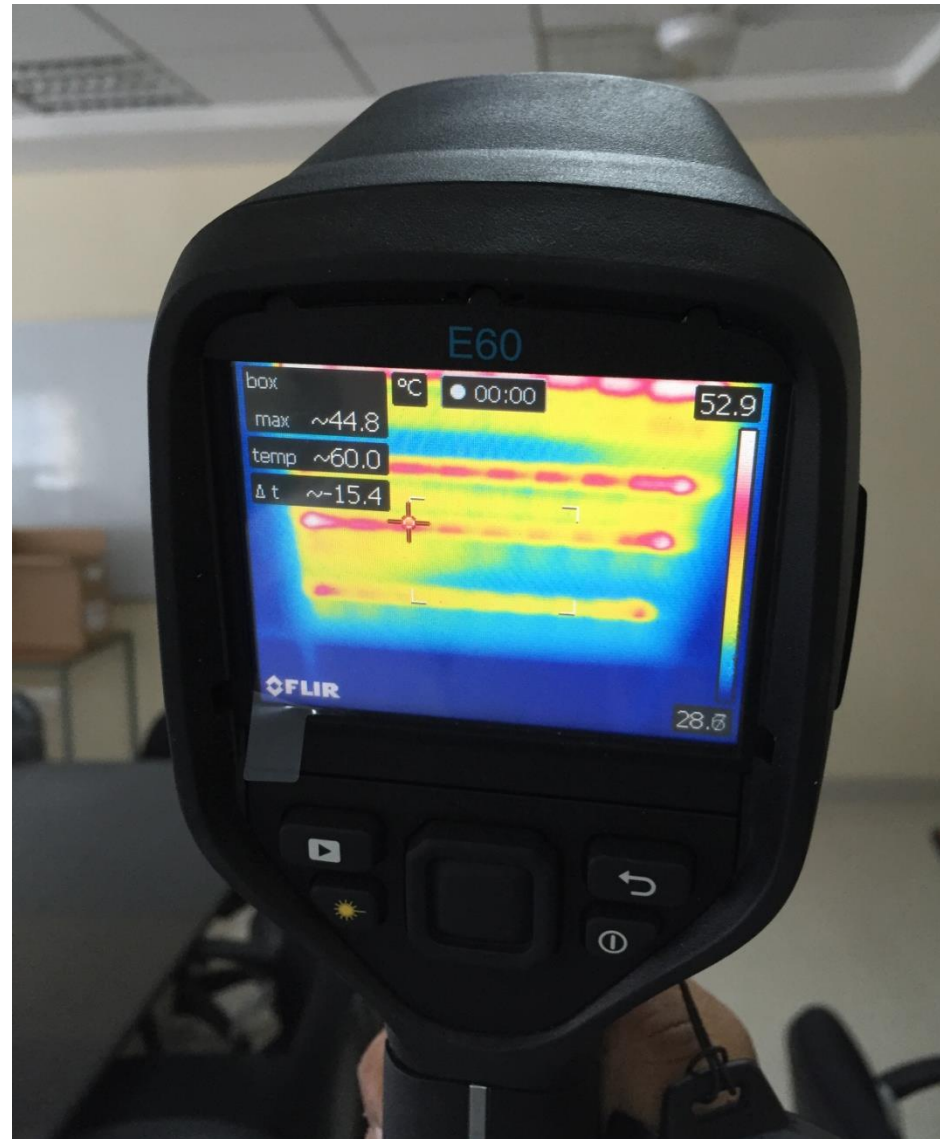
Gear / Shaft / Bearing Condition Monitoring System



Bearing Condition Monitoring Rig



Thermal Imaging Camera



Laboratories

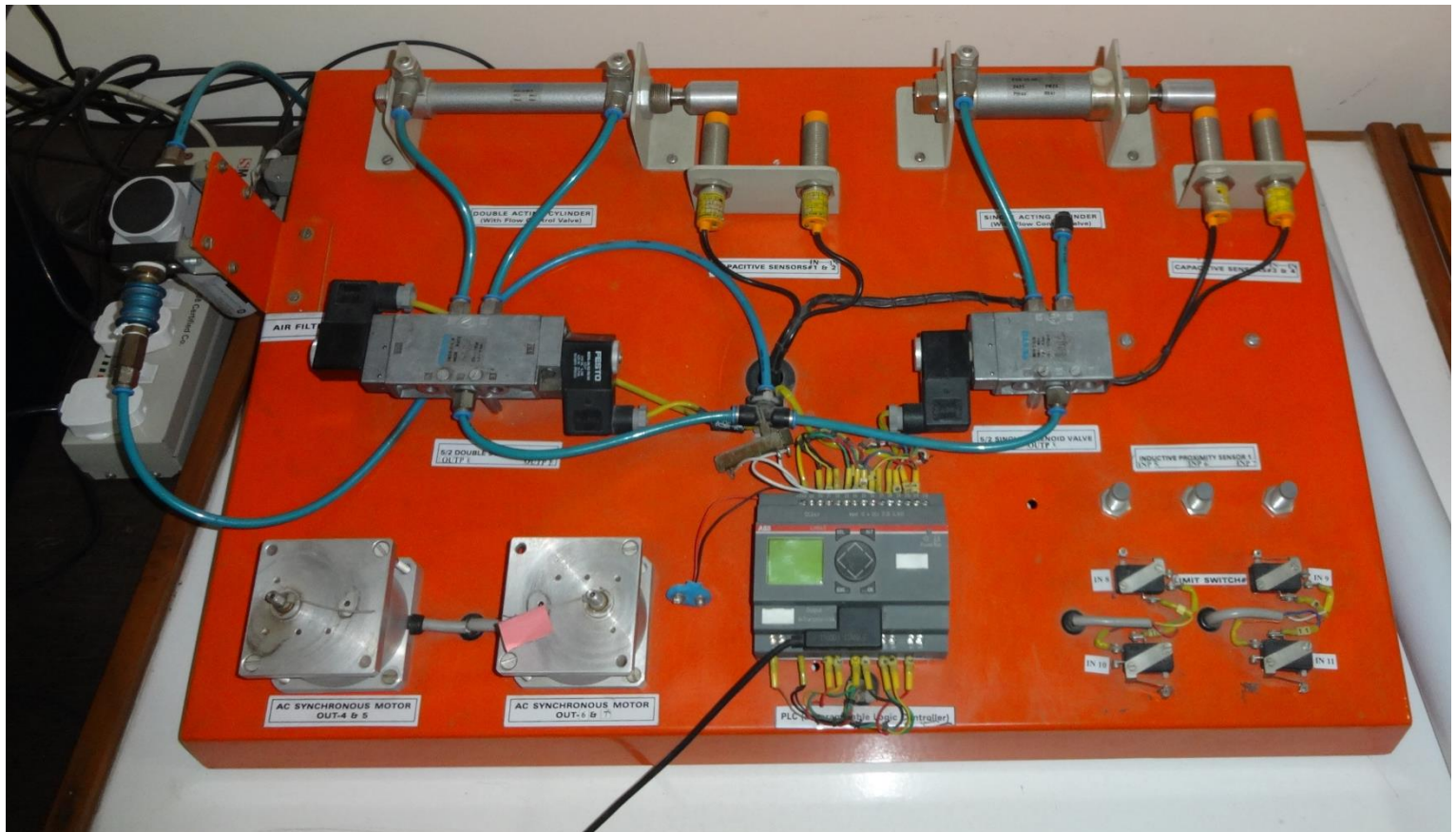


MECHATRONICS & AUTOMATION

Electro-Hydraulic Experimental Kit



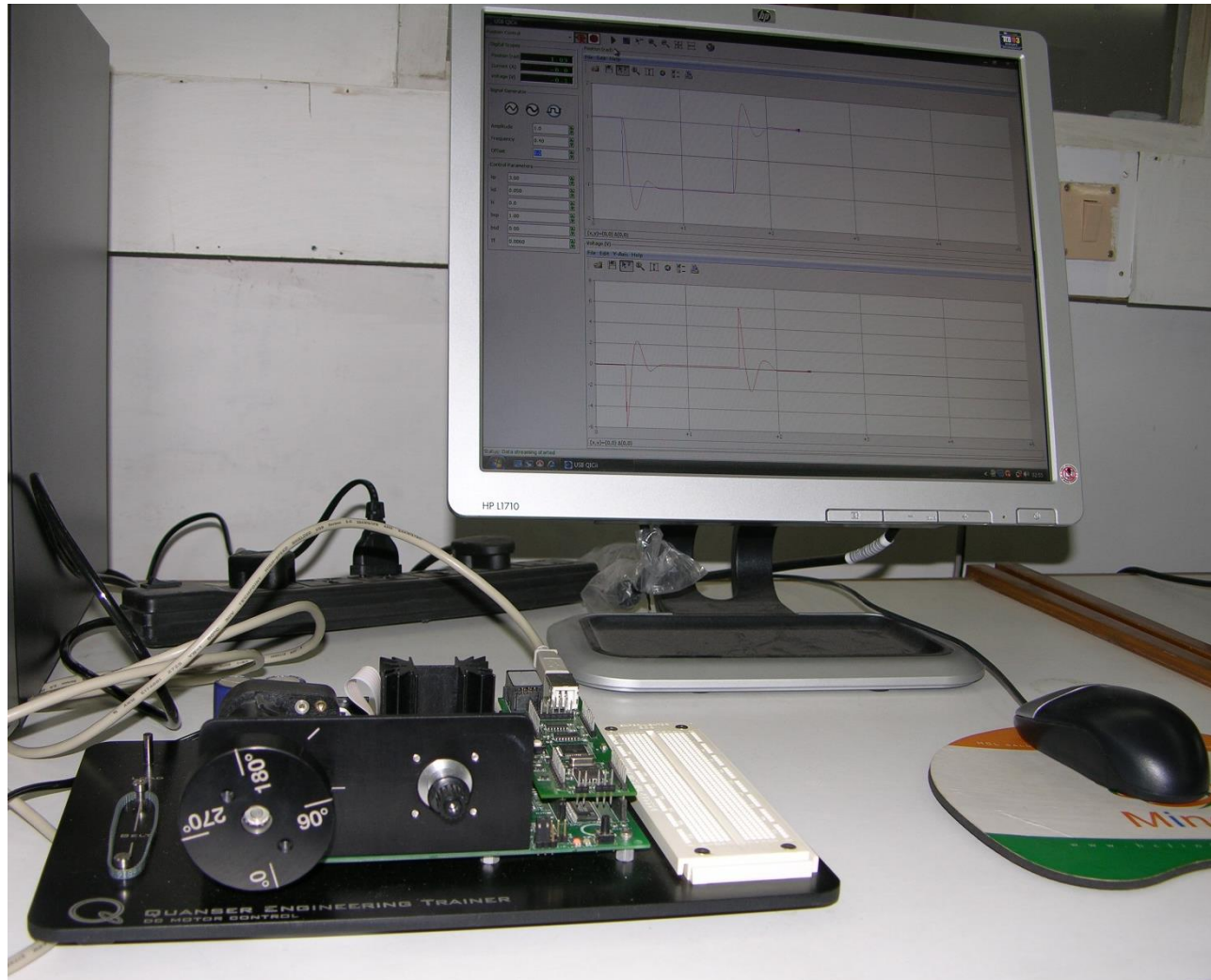
PLC controlled Electro-Pneumatic Kit



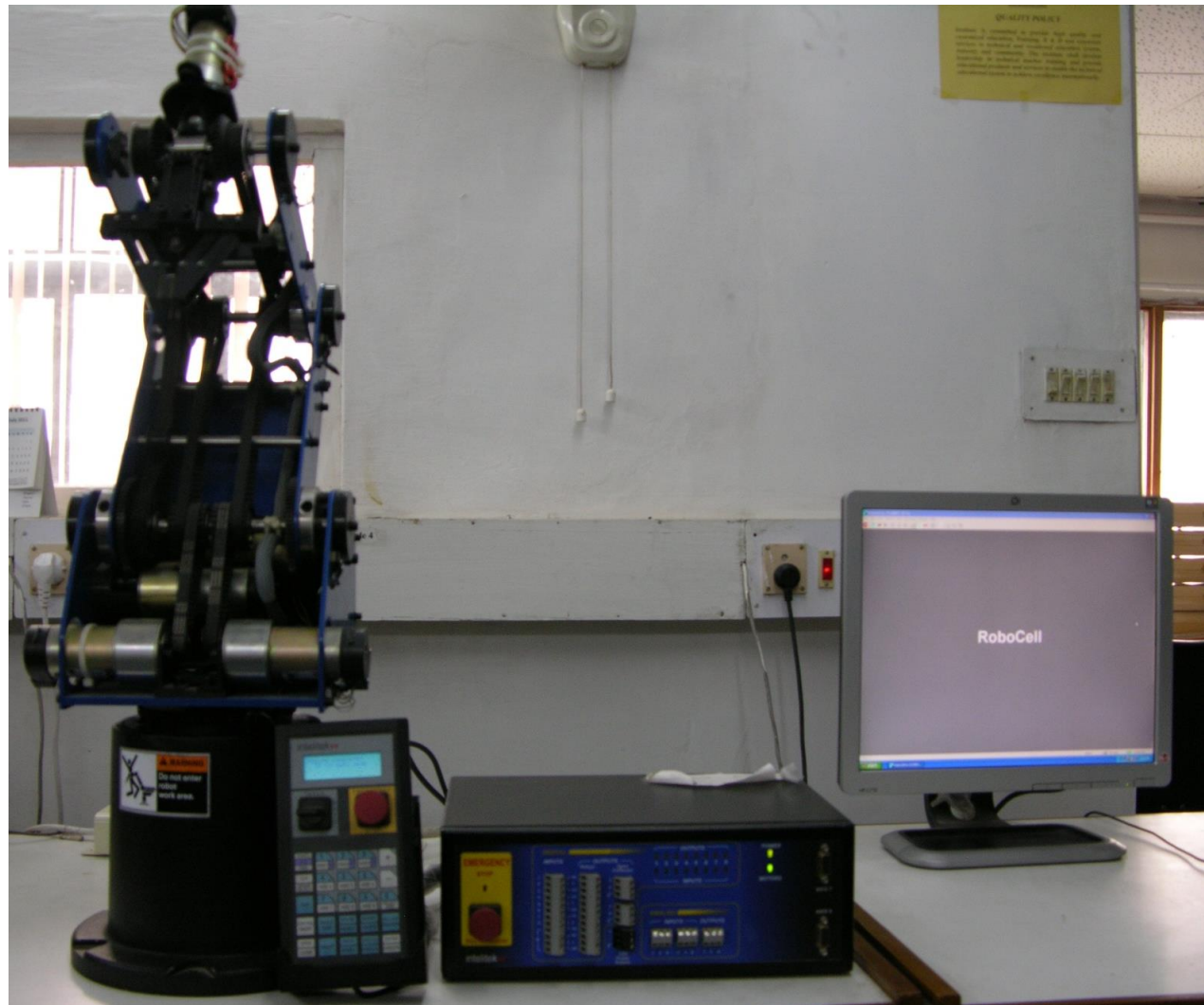
Electronically Controlled X-Y Table, Conveyer and Rotary Table



Microcontroller based DC Motor Control System



Robotic Manipulator



Data Acquisition Board



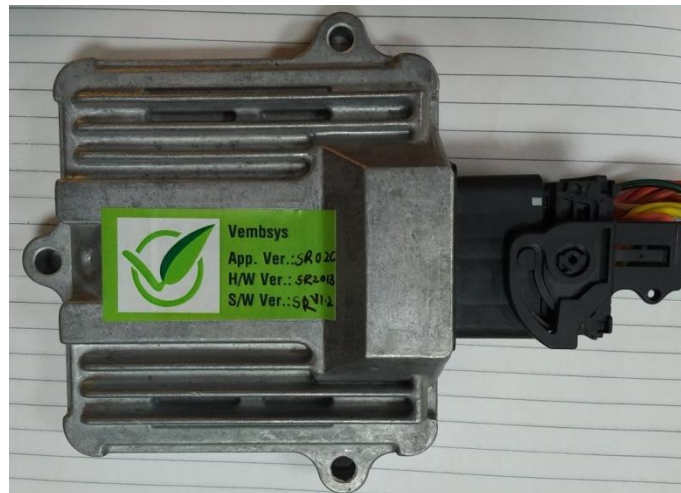
Brushless DC Motor Control Trainer



Stepper Motor Control Trainer



Electronic Fuel Injection System Test Bench with ECU



Limitations of the Department

- Non-flexible programs
- Being an affiliated institute
 - Not able to float need-based programs
 - Rigid curriculum structure
 - Limited International collaboration for innovative research activities
- Research funding to support students for Ph.D. programs
- Inadequate technical support staff

Strategy to overcome Limitations

- Starting of innovative programs at different levels to attract
 - Students from within and outside the country
 - Industry professional
- Align curriculum with OBE and NEP-2020
- MoUs with foreign universities for floating globally accepted programs and enhancing academic/research collaboration

(One Indo-Portugal proposal submitted to DST in 2020)

Strategy to overcome Limitations (Contd.)

- Focus on externally sponsored R & D projects (both Government / Non-government) to support JRF / SRF / RA
(6 projects submitted in last one year)
- Enhancing consultancy by continual laboratory development for IRG generation to support research scholars
- Earn-while-learn schemes

Lab up-gradation strategy

- Focus on enhancing laboratory facilities in the areas of digital and sustainable manufacturing
- Generating funds for laboratory upgradation through
 - Government / Industry funded projects
 - NABL accreditation of lab facilities for generating substantial revenue from testing
- Providing training to faculty and staff in latest areas

Future Plans

- Programs with multi-entry-multi-exit options
 - PG Programs
 - Mechanical Engineering (Robotics), 2020-21
 - Mechanical Engineering (Digital Manufacturing), 2025-26
 - PG Diploma Programs
 - Additive Manufacturing, 2022-23
 - Material Characterization, 2023-24
 - Institutional Assessment, Accreditation and Ranking, 2021-22
 - Advanced Certificate Program
 - Robotics, 2022-23

Future Plans

- Launching joint programs with
 - Foreign Universities
 - Industry
- Launching customized programs for industry professionals
- Collaborate with different national and state organizations for joint projects
(Five projects have been submitted jointly in 2020)
- Infrastructure building through funding from research bodies
(A Project for Rs. 1 crore submitted in 2020)
- Improving institute-industry collaboration

Future Plans (Contd.)

- Boosting consultancy by taking up industrial projects
- Enhancing IPR through product design & development
- International interaction through hosting
 - GIAN programs
 - International conferences
- Conducting India-specific research & development
- Enhancing inter-disciplinary research
- Hiring of Inspire faculty

The collage features 12 images of industrial and laboratory equipment:

- Top-left: A large industrial machine with a control panel.
- Top-middle-left: A smaller industrial machine on a stand.
- Top-middle-right: A robotic arm in a laboratory setting.
- Top-right: A group of people sitting at a long table with multiple computer monitors.
- Middle-left: A HURCO VM10 industrial machine.
- Middle-middle-left: A tall industrial control cabinet.
- Middle: A large central logo with the text "360°" in blue, a green curved arrow pointing right, and the text "Virtual Tour" in blue below it.
- Middle-middle-right: A close-up of a robotic arm.
- Middle-right: A laboratory setup with a laptop and various electronic components.
- Bottom-left: A robotic arm on a desk next to a laptop.
- Bottom-middle-left: A desk with various electronic equipment and cables.
- Bottom-middle-right: A desk with electronic equipment and cables.
- Bottom-right: A laptop displaying a "DATA ACQUISITION SYSTEM" flowchart and a "SERIAL-BASED DATA ACQUISITION SYSTEM" circuit board.