

2024 - 25



Departmental Brochure

Department of Mechanical Engineering

IIT Delhi

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Welcome



Prof. M.R. Ravi Head of the Department Mechanical Engineering

“Department of Mechanical Engineering at IIT Delhi, an Institution of Eminence, is well known for its pursuit of excellence, reflected by its consistent QS rankings – in 2024, it is ranked 50th in the world. Students of the Department strive for excellence in academics as well as extracurricular activities. Our alumni make us proud with outstanding achievements in their pursuits in academia, industry, and entrepreneurial ventures. On behalf of the Department, I welcome you to explore our talent pool of UG, PG, Ph.D., and VLFM students, and I am sure you would be delighted with their capabilities.”



About Us

The Department of Mechanical Engineering at IIT Delhi is one of the oldest and biggest departments of the institute with a student strength of around 950. It is a hub for cultivating exceptional engineers known for their academic excellence and problem-solving prowess. We attract the brightest minds in India through rigorous entrance exams like the JEE Advanced & GATE. Our world-class faculty, state-of-the-art research labs, and cutting-edge research have made this department a center of excellence which is well reflected by the consistently improved QS rankings.

The department has four areas of specialization: Mechanical Design, Production Engineering, Thermofluids and Industrial Engineering. We carry out interdisciplinary research covering fields like, Biomedical, Public Systems, Data-Driven Methods, and Machine Learning. We also have many established CoEs that collaborate with industries to solve many research problems. All these facilities provide the students with ample opportunities to take part in research and be an asset for the industry.



यांत्रिक इंजीनियरी विभाग
DEPARTMENT OF MECHANICAL ENGINEERING

Programs



UG level Programs

Bachelor of Technology [B.Tech]

4 year under graduate program that is offered in two disciplines:

- **B.Tech in Mechanical Engineering.**
- **B.Tech in Production and Industrial Engg.**

BTech with Advanced Standing Program

5 years integrated program where students obtain both their B.tech and M.tech degrees.

PG level Programs

Master of Technology [M.Tech]

2 years graduate level course with four specializations:

- **M.Tech in Mechanical Design**
- **M.Tech in Industrial Engineering**
- **M.Tech in Production Engineering**
- **M.Tech in Thermal Engineering**

Master of Science(Research) [M.S.(R)]

Similar to M.Tech program with more focus on Research .

Doctor of Philosophy[PhD]

Doctoral program that includes extensive research and depth in various specializations.

VLFM

Post Graduate Diploma for Executives
Visionary Leaders for Manufacturing

Why Us?



1

Continuously updated curricula to meet modern industrial needs.

2

Students gain hands-on experience with state-of-the-art labs and software and are well-trained to meet complex challenges.

3

Exposure to Government and industry sponsored projects give the students a practical experience and enhance their analytical and critical thinking.

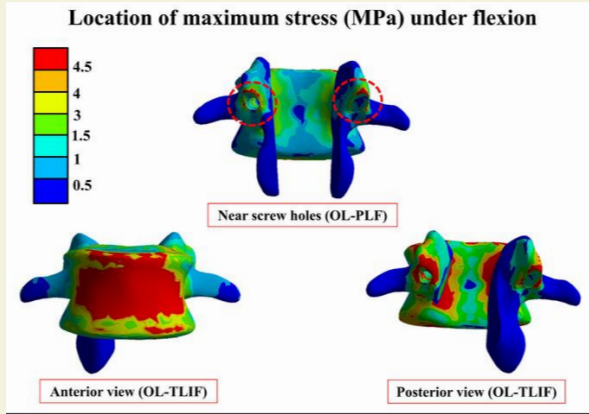
4

Students engage in clubs, large group projects and extracurricular activities to gain excellent soft skills.

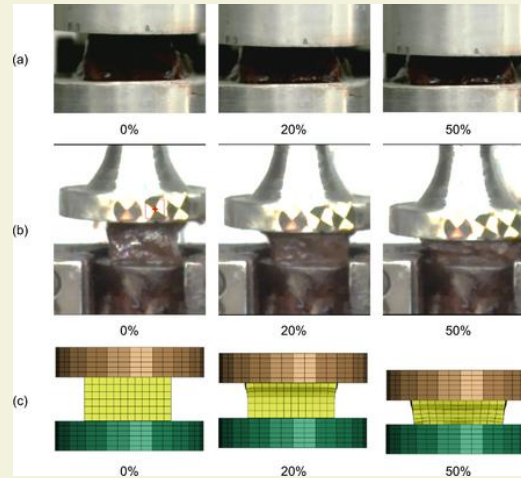
5

Strong alumni network with a history of industry leadership.

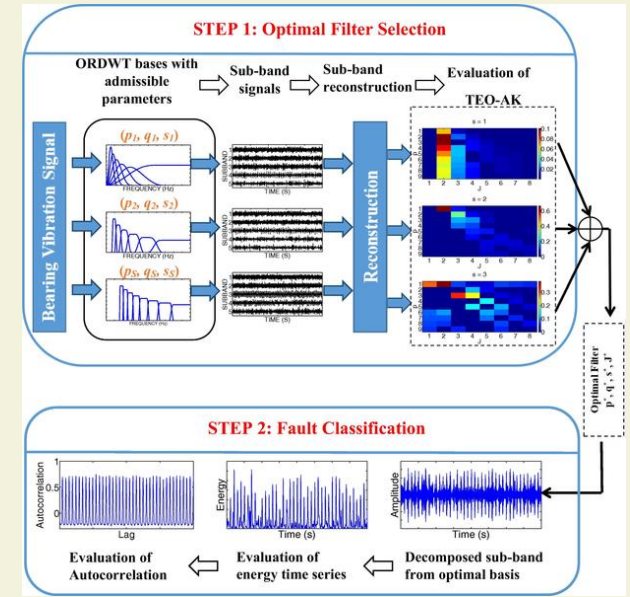
Mechanical Design



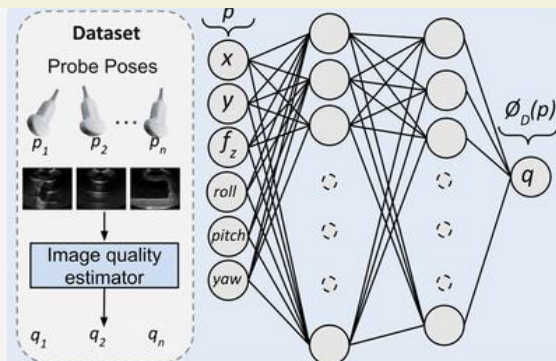
Biomechanics



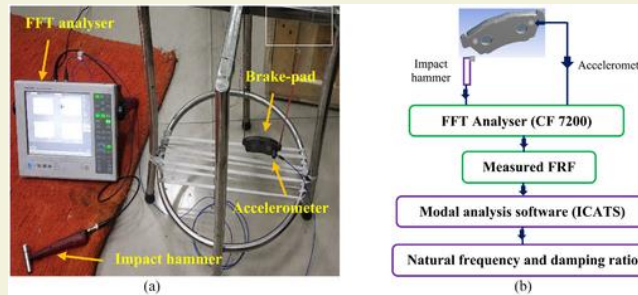
FEA tissue modelling and validation



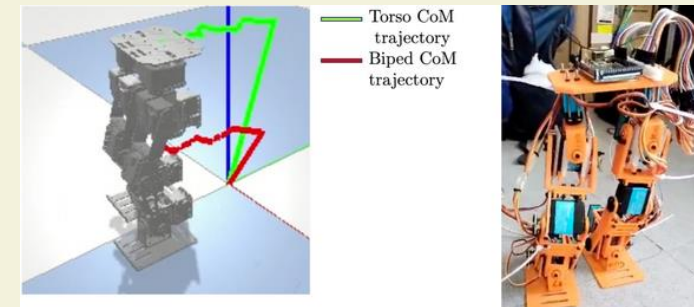
Bearing fault diagnosis approach based on ORDWT



Applied Artificial Intelligence



Noise and Vibration Control for brake pads using binders

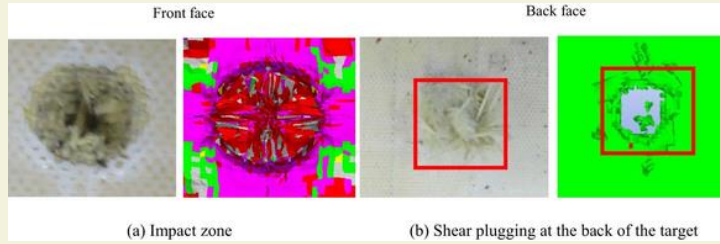


Robotics and Control

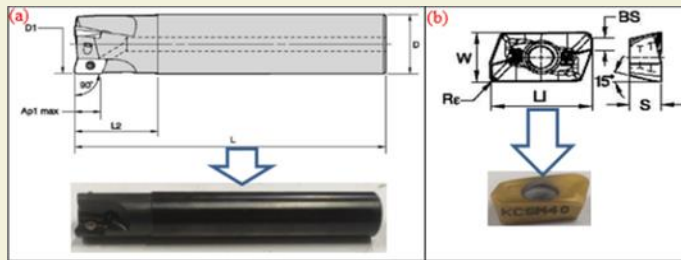
Production Engineering



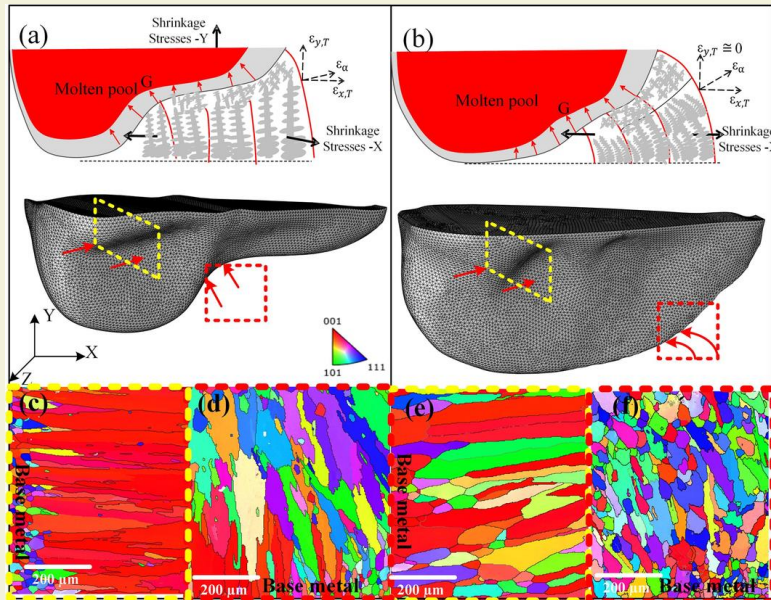
GLIMPSES OF OUR RESEARCH



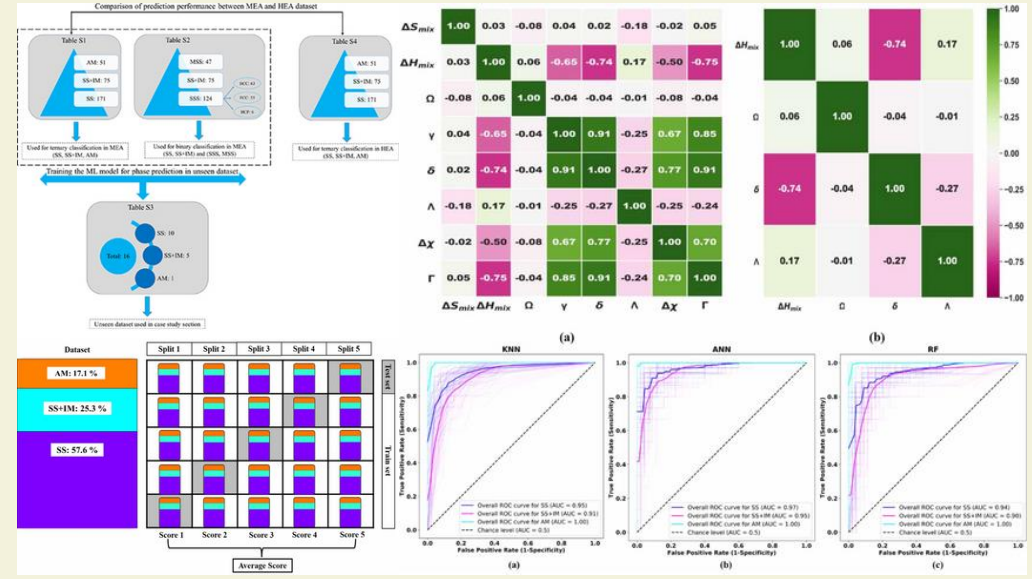
Composite Design and Modelling



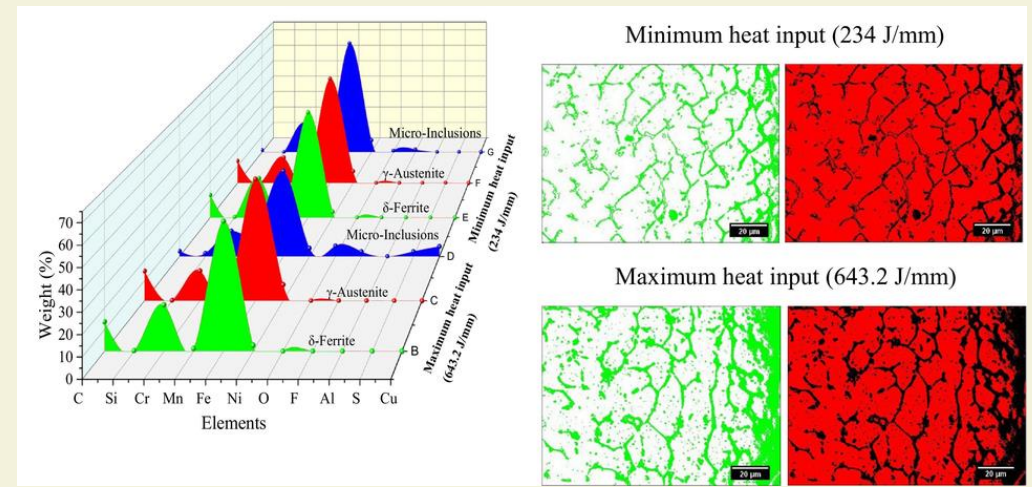
Advanced Machine Tool Development



In-situ monitoring of molten pool shape during remote laser beam welding



Machine learning based phase prediction of medium entropy compositionally complex alloys

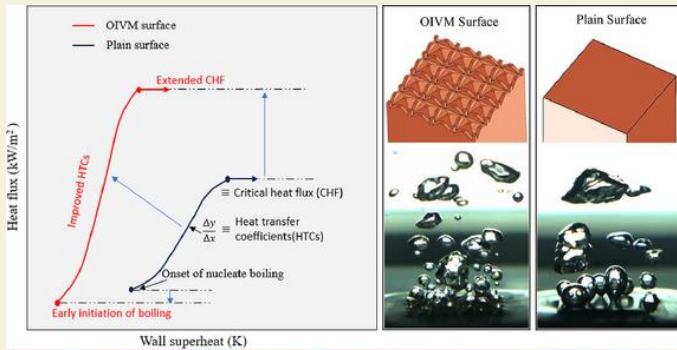


Influence of heat input on the evolution of δ -ferrite grain morphology of SS308L fabricated using WAAM-CMT

Thermal Engineering



GLIMPSES OF OUR RESEARCH

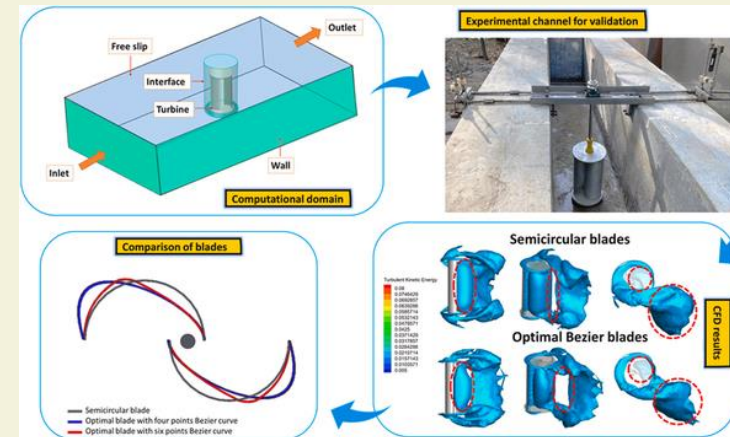


The main advantages of employing the OIVM surface: (1) Enhanced surface area (2) Early initiation of boiling (3) Increased nucleation sites (4) Improved HTC (5) Separate liquid-vapour pathways (6) Macroconvection mechanism (7) Efficient rewetting mechanism and (8) Extended CHF

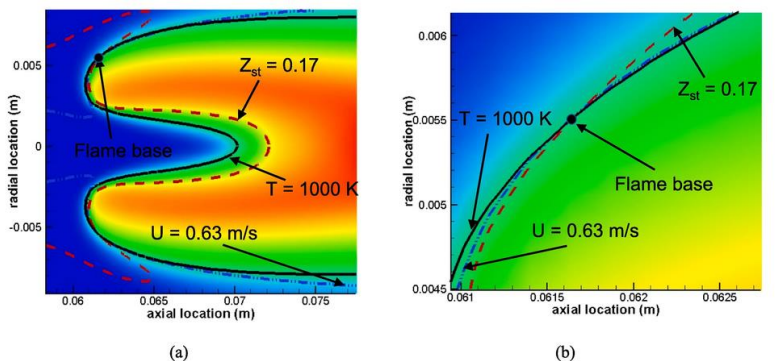
Heat Transfer



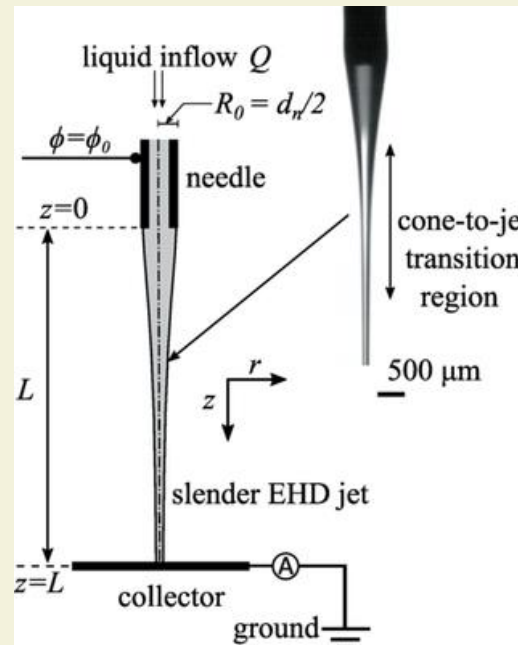
HVAC



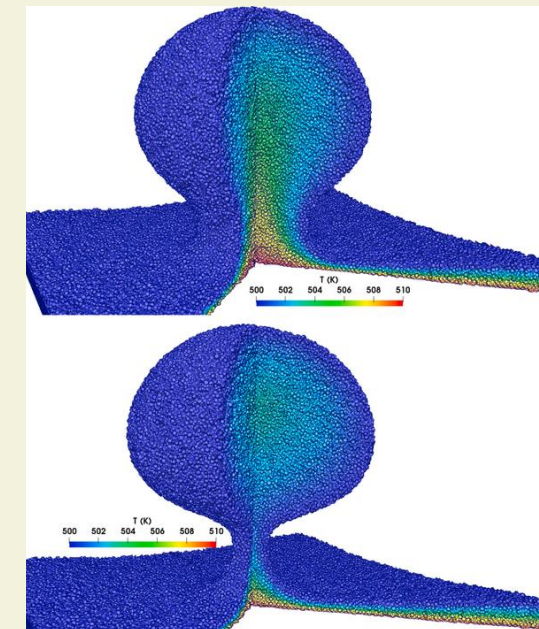
Optimization of turbine blades



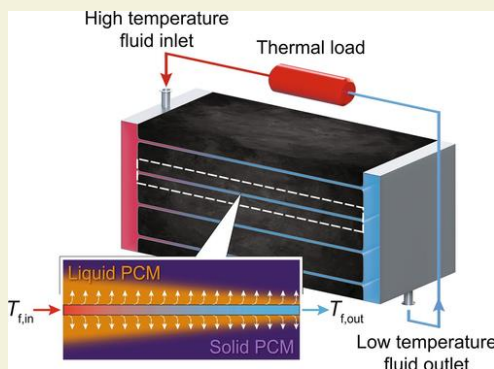
Flame modelling and combustion



Electrohydrodynamic Jets



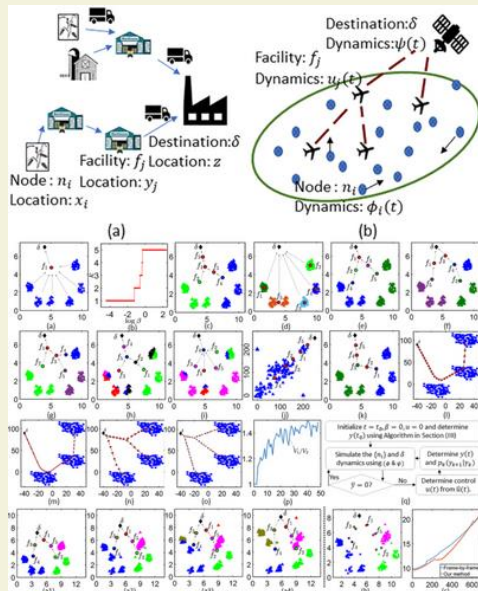
Computational Fluid Dynamics



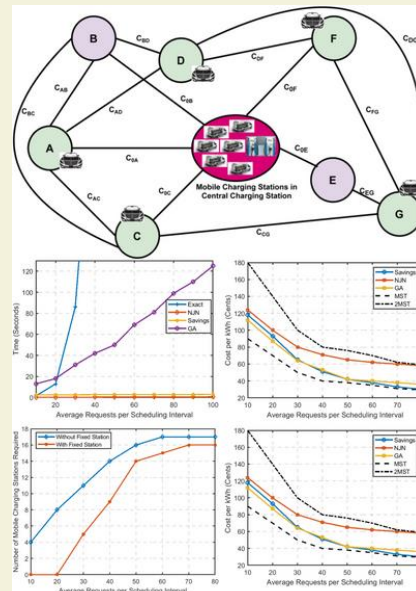
Thermal Energy Storage

Industrial Engineering

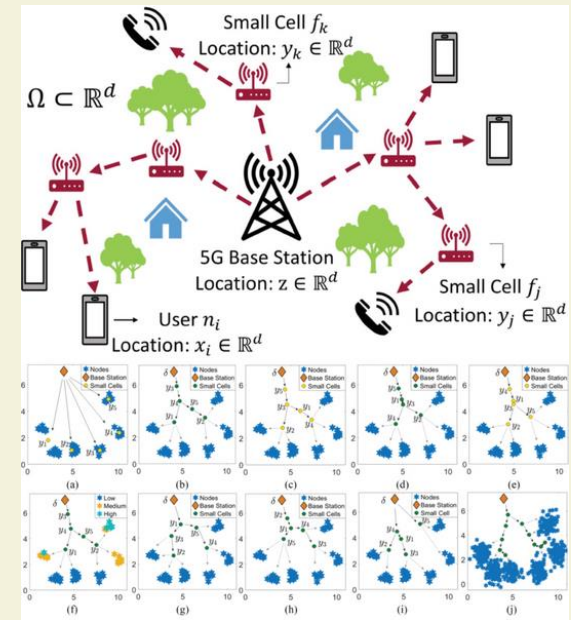
GLIMPSES OF OUR RESEARCH



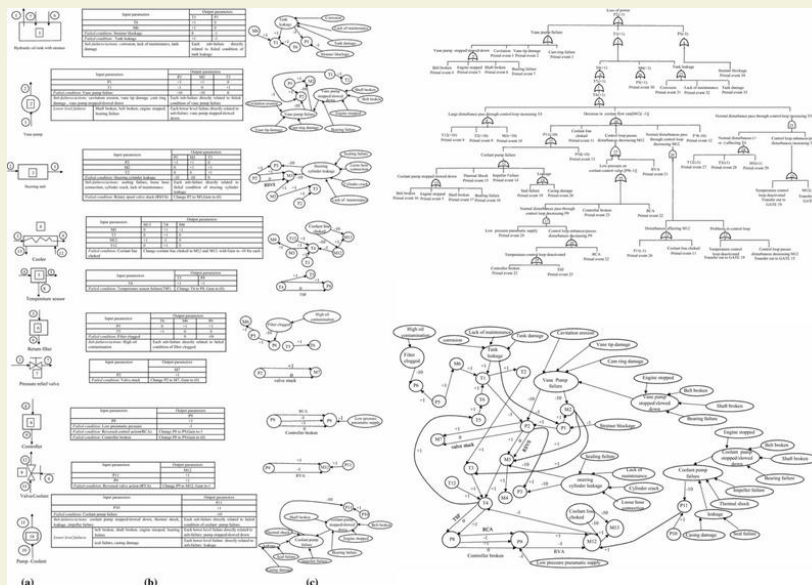
Simultaneous Facility Location and Path Optimization in Static and Dynamic Networks



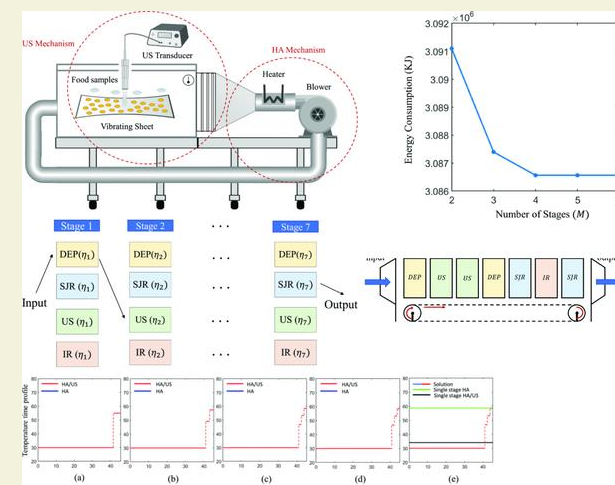
Scheduling and Routing of Mobile Charging Stations With Stochastic Travel Times



Parameterized MDPs and Reinforcement Learning Problems

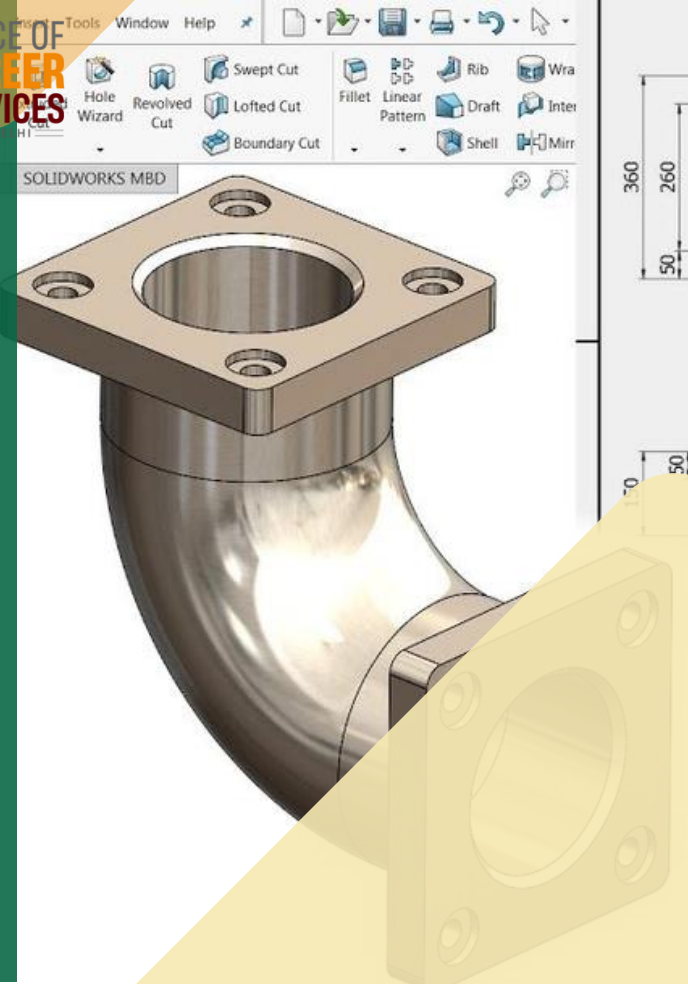


Fault diagnosis of automobile systems using fault tree based on digraph modeling



Efficient Modularity in Industrial Drying: A Combinatorial Optimization Viewpoint

About Us



There are two undergraduate degree programs offered by the department, namely:

- **B.Tech in Mechanical Engineering and,**
- **B.Tech in Production and Industrial Engineering.**

Students begin their courses starting with institute core courses in basic sciences such as Physics, Chemistry, and Mathematics to a wide range of engineering arts and sciences such as engineering mechanics, computer science, environmental science, electrical engineering, engineering visualization product realization, material science, numerical methods, statistics, and humanities. Then the move to program-linked core courses which are specific to either degree as below.

There are rigorous laboratory classes in their 3rd and 4th year to promote hands-on learning and enhance practical experience. In their final year, students do a semester-long B.Tech. projects where they directly get involved in actual faculty research and industrial design work, which prepares them for taking design and creation work and familiarizes them with the finer details involved in the execution of a practical project.



B.Tech MECHANICAL DEPARTMENT



Courses

Mechanical Engineering

- Solid Mechanics
- Fluid Mechanics
- Kinematics and Dynamics of Machines
- Manufacturing Processes
- Engineering Thermodynamics
- Mechanical Engineering Drawing
- Design of Machines
- Control Theory and Applications
- Energy Systems and Technologies
- Heat and Mass Transfer
- Introduction to Operations Research
- CAM and Automation
- CAD and Finite Element Analysis
- Manufacturing System Design
- Mechanical Engineering Laboratory
- Manufacturing Laboratory
- Mechanical Engineering Laboratory
- Introduction to Statistics

Production & Industrial Engineering

- Solid Mechanics
- Kinematics and Dynamics of Machines
- Metal Forming and Press Tools
- Near Net Shape Manufacturing
- Metrology and Quality Assurance
- Welding and Allied Processes
- Material Removal Processes
- Thermal Science for Manufacturing
- Mechanical Engineering Drawing
- Design of Machines
- Control Theory and Applications
- Stochastic Modelling and Simulation
- Introduction to Operations Research
- CAM and Automation
- Micro and Nano Manufacturing
- Production Engineering Laboratory
- Industrial Engineering Laboratory
- Composite Materials and Manufacturing
- Introduction to Statistics

Tools & Software

- ANSYS
- Hypermesh
- Autodesk Inventor
- Solidworks
- MATLAB
- Python
- C / C++
- SQL , MongoDB
- Excel
- Tableau/ PowerBI
- SPSS Solvers like CPLEX , Gurobi
- Anylogic
- Google OR Tools

UG Projects



Structural and Mechanical Design

- Energy absorption capabilities of gyroid structures
- Study of open cell structures for high fatigue strength and low weight
- Design and development of a Smart Beam
- Design of cable car cabin
- Design of 3D Food Printer
- Table top fatigue testing machine for testing miniature samples
- Damping in blisk design using split rings
- Modular wind turbine design and fabrication
- Design and Analysis of Sheep Shearing Device and Carpet Looms
- Design and prototype development of compact and cost-effective lift for 2-story village houses

Biomedical Engineering

- Biomechanics of total shoulder replacement
- Influence of tibial keel design on knee replacement success: a finite element study
- Development of variable size detachable cannula
- design of an integrated suction-irrigation device for surgeries under microscope
- Wave propagation in bone structure

Control Systems and Automation

- Control of structural systems using reinforcement learning
- Control of a Flying Unicopter with Payload Variation
- Imitation Learning from MPC for Quadrupedal Multi-Gait Control
- Predictive Maintenance using AI/ML

Material Science and Surface Engineering

- MRE Materials (Magnetorheological Elastomers)
- Development of computationally efficient solver to find the elastic deformation at the concentrated elliptic contacts
- Studies on some elastic mechanisms

Digital and Smart Manufacturing

- Dimension measurement of object using computer vision
- Track check in Helicopter Main Rotor Blade using image processing

Acoustics and Vibration

- Acoustic modeling of a large LHC room
- Chaos Control

UG Projects



Logistics and Supply Chain

- ONDC based Logistics Business Model
- Re-Commerce Supply Chain Optimization Model
- AI integration with Supply Chain and Optimization
- Applications of Learning and optimization in logistics

Traffic and Simulation:

- City-wide simulation of traffic dynamics for heterogeneous fleet of vehicles
- Simulation modeling, control, and planning for non-Newtonian fluid robots
- Metamodel based network Simulation

Optimization and Mathematical Programming:

- Capacitated Simultaneous Transportation & Production Problem
- Mathematical programming based optimization of industrial machine workload balancing problems
- Generalized Nash Equilibrium Problems with Mixed-Integer Variables
- Constraint programming and multiobjective optimization approaches for railway scheduling

- Multiobjective derivative-free optimization of parameters for a concentrating solar power plant
- Parallel Algorithms for Mixed-Integer Nonlinear Optimization
- Simulation optimization package development
- Portfolio Optimization
- Sequential decision making/Optimization in financial networks
- Design of structure using topology optimization using integer and nonlinear programming techniques

AI, Machine Learning, and Data Processing:

- Advanced Applications of AI-based Data Processing
- Development of neuroscience inspired Graph Neural Network and its application in computational mechanics
- Dynamic Graphs and Graph Coarsening
- Predictive Analysis
- Classification of human emotions by examination of vocal acoustic features

UG Projects



Industry-Specific Applications:

- Public Distribution System
- Food Systems
- Judicial Analytics
- Analysis of Key Indian Economy Sectors
- An analysis and evaluation of policies related to cottage industries
- Decision Support System
- Model subscription packages in various industries, ranging from food to retail and more
- Analyse the impact of nudges in the AC industry to optimize for energy efficiency

Other Applications:

- Design of Software Defined Networks
- OR/MS publications - bibliometric analysis
- Provable regret bounds for multi-armed bandit problems

Areas of Expertise:

- **Finite Element Analysis**
 - Automotive Crash Safety
 - Impact & High Strain Rate Simulations
- **Noise Vibration & Harshness**
 - Vibration and Noise Control
 - Condition Monitoring
 - Rotor Dynamics
- **Tribological System Design**
 - Optimized Bearing Design
 - ML Implementation
- **Robotics and control**
 - Advanced Mechanisms
- **Biomedical engineering**
 - Human Body Modeling
 - Impact Biomechanics

Why us?

- Mechanical Design encompasses creating, analyzing, and refining products from simple parts to complex machinery.
- Meanwhile emphasizing development of complex machinery with high performance, manufacturability, and better testing criteria.
- Our program covers active noise control, advanced mechanisms, automotive safety, biomechanics, control systems, fracture analysis, human body modeling, and vibration monitoring.
- Students acquire skills through industry R&D projects, focusing on problem-solving, critical thinking, and hands-on experience with CAE tools, prototyping, testing, and system validation.



M.TECH. MECHANICAL DESIGN



Projects

Biomedical engineering

- Biomechanical evaluation of implant failure

High strain-rate crash & fracture analysis

- Development of a car model for use in crash & durability applications
- Fracture analysis of semiconductor devices
- Impact and blast attenuation of cellular structures

Control Engineering

- Design and development of on Ground Satellite Handling System with two-axis C.G. adjustment using closed loop feedback control

Noise and Vibration

- Noise & vibration analysis of balancing piston of aeroengine rotor
- Investigating the noise and design of low noise tyres

Precision Machines

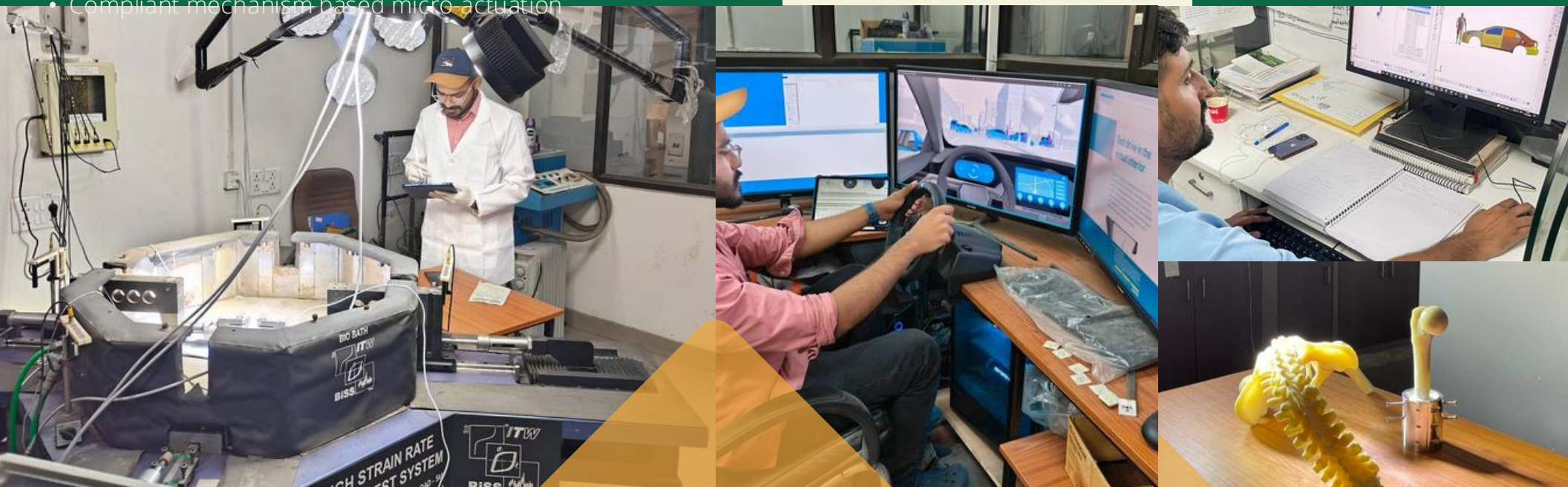
- Design and fabrication of compliant based robotic hand for grasping.
- Compliant mechanism based micro-actuation

Courses

- Design & Optimization
- Control Engineering
- Design of Precision Machines
- Designing with Advanced Materials
- Experimental Modal Analysis
- CAD & FEA
- Rotor Dynamics
- Vibration & Noise Engineering
- Tribological Systems Design
- Multi-Body Dynamics
- Analytical Dynamics
- Continuum Mechanics

Tools

- ANSYS
- ABAQUS
- LS-DYNA
- COMSOL Multiphysics
- Hypermesh
- MATLAB
- Rhino
- Radioss
- MIMICS
- RecurDyn
- MSC Adams
- LabView
- Autodesk Inventor
- Solidworks



Areas of Expertise:

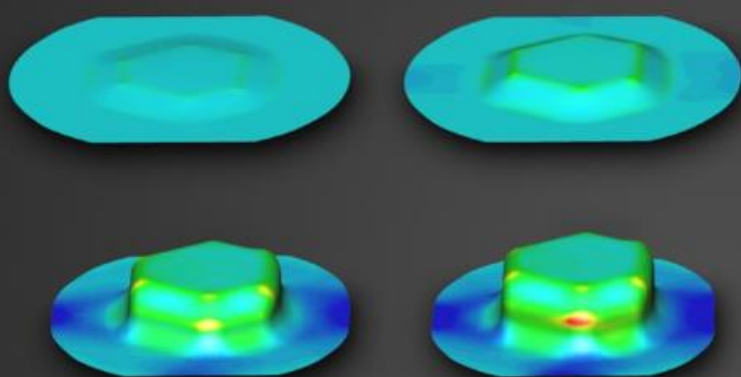
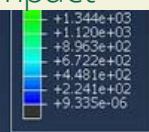
- Scientific Computing
 - FEA
 - Optimization
- Manufacturing Automation:
 - IIoT
 - Machine Learning in Manufacturing
 - Cyber-Physical Systems
 - Industrial Networking Protocols
 - Manufacturing Execution System
- Additive Manufacturing
 - Polymeric Stents
 - Wire Arc Additive Manufacturing
- Metal Joining and Forming
- Surface Engineering
- Material Science
- Composite Materials for Impact

Why Us?

- The curriculum includes traditional subjects but teaches to make use of advanced computational tools to optimize the process.
- Students learn modern manufacturing techniques by working on projects and hands-on on advanced machines.
- Students work on interdisciplinary projects like biomedical devices, industrial networking, etc. This enables them to know a multitude of subjects.
- Students graduating from this program can be aptly called "Master of one, explorer of many."



M.TECH. PRODUCTION ENGINEERING



Projects



Digital Manufacturing and Smart Manufacturing

- Online wear monitoring and Tool Failure Prediction using Machine Learning and Simulation
- Welding quality analytics using Deep Learning
- Software Support for Enhanced 3D Printing Capabilities

Material Science, and Surface Engineering

- High Entropy Alloys - Nano particles fabrication and characterization study
- Development of Hard coatings using PVD
- Machining of materials used in aerospace industry using coated tools
- Friction Stir Processing
- Post heat treatment study and characterization of WAAM single wall structures
- Design and Fabrication of Antiballistic structures

Additive Manufacturing

- Additive Manufacturing of advanced cutting Tools
- 3D Printing of Supercapacitors
- 3D Printing of elements for Integrated Energy Storage
- Additive Manufacturing of 3D lattice structures
- Design and fabrication of Auxetic sport protectives by Additive Manufacturing.

Metal Joining

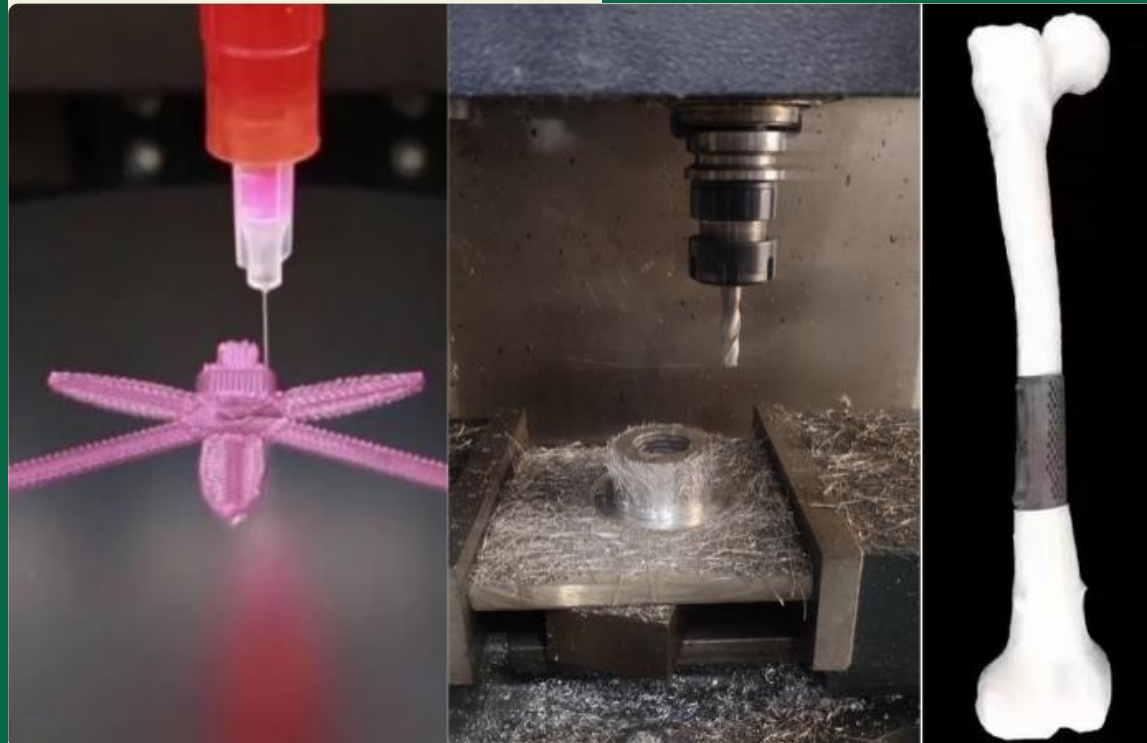
- Joining of Thin sections using Micro-TIG and resistance spot welding.
- Laser Welding of multifoil for EV Application
- Effect of surface texture of laser welding of metal and plastics

Courses

- Machining Process and Analysis
- Welding Science Technology
- Metal Forming
- Computer Aided Manufacturing
- Computational Methods
- Experimental Methods
- Additive Manufacturing
- Processing and Mechanics of Composite Materials
- Industrial Engineering Systems
- Supply Chain Management

Tools

- Finite Element Analysis
 - ANSYS
 - ABAQUS
 - LS-Dyna
- Part Modelling and CAM
 - SolidWorks
 - Autodesk Fusion
- Programming Languages/Env
 - MATLAB
 - Python
- IIoT -
 - ThingWorx
 - KepWare Tools
 - UA Server
- Robotics - RoboDK, ROS
- Unity
- LabView

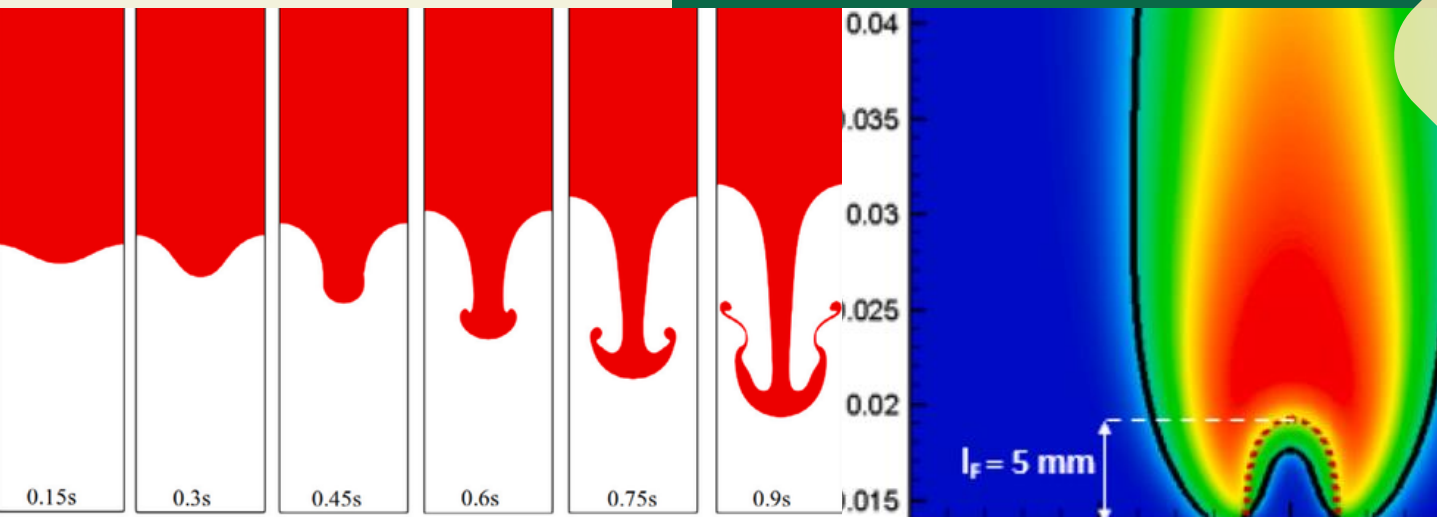


Areas of Expertise:

- CFD
 - Heat Transfer
 - Multi-phase flows
 - Droplet/Bubble Physics
 - Machine Learning
- Combustion
 - Flame modelling
 - Thermal power generation
- Turbomachinery
 - Steam & Gas turbines
 - Compressors
- HVAC
- Energy Storage (Batteries)
- Nano and Micro-fluidics

Why Us?

- Advanced training in topics like heat transfer, thermodynamics, fluid mechanics, energy systems, combustion, micro-fluidics, etc.
- Providing a blend of theoretical knowledge with practical applications and providing hands-on experience through state-of-the-art labs and computational facilities.
- Research projects supported by industry and government partnerships, prepare students for diverse sectors including aerospace, automotive, energy, and manufacturing.
- With a focus on both fundamental principles and emerging technologies, the program equips graduates to excel in their careers and advance thermal technologies for a sustainable future.



**M.TECH.
THERMAL
ENGINEERING**



Projects



CFD / Heat Transfer

- Development of a two-phase flow solver with adaptive mesh.
- Development of IVP and method-of-lines solvers for transient problems in multiphase flows and atmospheric science.
- Production of turbulent kinetic energy during shock-driven combustion of droplet clusters.
- Droplet Splashing Over a Moving Porous Substrate.
- Electro-hydrodynamic instabilities driven by time-periodic electric field.
- Propeller profile optimization for noise reduction in UAVs.

Combustion

- Co-firing thermal power plants with biomass for cleaner power.
- Structures of Laminar Diffusion Flames for Diluted Fuels.
- Spray flame interactions in a swirling flame.
- Investigation of Specific Gasification Rates of biomass fuels for TLUD gasifier design.
- Soot measurement in laminar coflow ethylene flames.

HVAC / Energy Storage

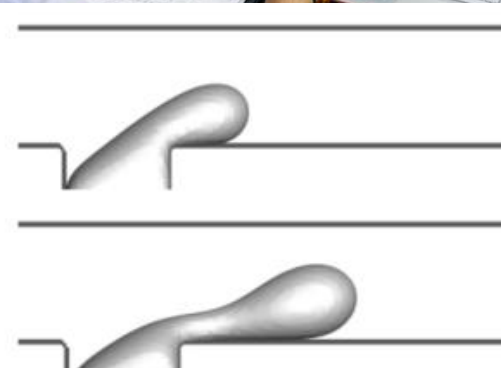
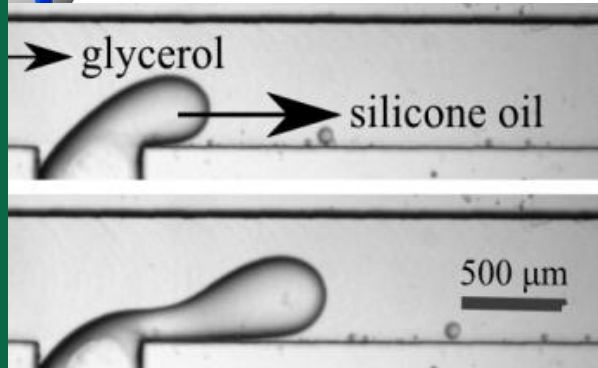
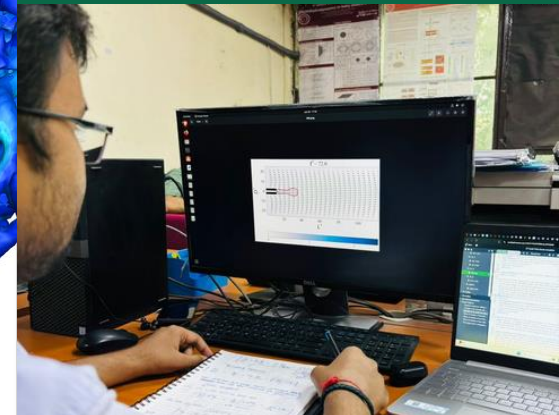
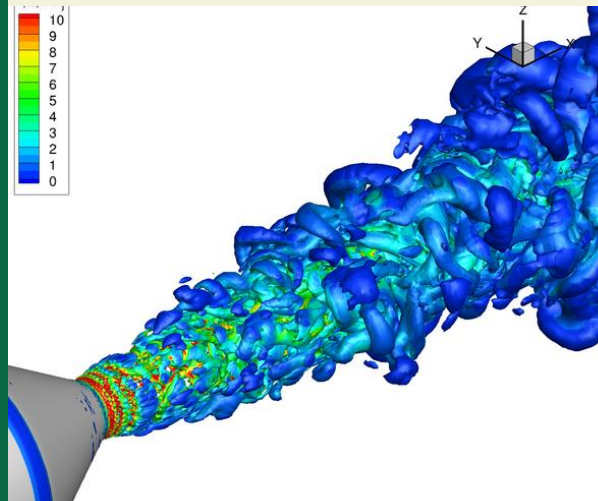
- Thermochemical Energy Storage System for HVAC.
- Numerical simulations of solid-liquid phase-change processes for thermal energy storage.
- Feasibility Study of a Central District Cooling/Heating Solution for IIT Delhi Campus.
- Development of machine-learning models for state-of-health estimation of commercial Li-ion battery packs.

Courses

- Computational Heat Transfer
- Combustion
- Gas Dynamics
- HVAC
- Thermal Design
- Radiation Heat Transfer
- Convective Heat Transfer
- Turbo Compressors
- Heat Exchangers
- Steam and Gas Turbines
- Adv. Fluid Mechanics
- Adv. Thermodynamics
- Design of Wind Power Farms

Tools

- **CFD tools**
 - ANSYS Fluent
 - OpenFOAM
 - COMSOL
 - ICEM CFD
 - PTC Creo
- **Other Software**
 - SolidWorks
 - LabVIEW
 - EES
- **Programming Languages**
 - MATLAB
 - Python
 - C / C++

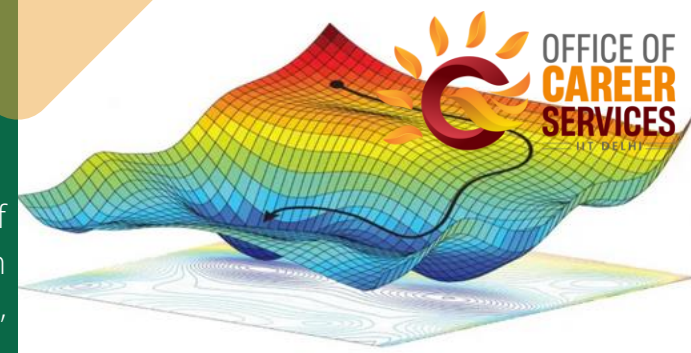


Areas of Expertise:

- Operations Research
 - Mathematical Modeling
 - Optimization techniques
 - Gurobi/CPLEX/Google OR tools
- Analytics
 - Data Analytics
 - SQL
 - Power BI/Tableau
- Programming
 - Python
 - Pandas, Numpy, Matplotlib
 - Pulp, Pyomo
- Simulation & Stochastic modeling
- Machine Learning
- AHP, VSM
- TSP, VRP

Why Us?

- The course offers a balanced combination of theoretical rigor and practical hands-on experience with modern solvers, software, and projects.
- Students receive comprehensive training in industrial engineering, optimization, and operations research to address complex, contemporary techno-managerial challenges.
- The curriculum is continually updated to meet complex challenges and enhance students' analytical and creative thinking abilities.
- Students gain hands-on experience through involvement in various government and



M.TECH. INDUSTRIAL ENGINEERING



Management
and
Consultancy



Projects

Analytics & Scheduling:

- Data-driven analysis of Indian Judicial system using Mathematical Modeling and ML techniques.
- Simulation and Dynamic scheduling of APM - type operations.

Health Care:

- Capacity planning for cancer care provision in India.
- Pharmacy store transaction data analytics for inventory management and disease profiling.
- Deep learning in health care (lung cancer detection)

Supply Chain & Logistics:

- Optimization of India's public distribution system using VRP and ILP/MILP for optimal warehouse tagging with Fair Price Shops to minimize QKM and Enhance Efficiency.

OR, Simulation & Optimization:

- Network design for sustainable future/entropy based methods.
- Simulation and optimization of appointment scheduling system in hospitals.
- Rake linking optimization.

Quantitative Finance :

- Developing hedging strategies for incomplete markets with deep reinforcement learning.

Courses

- Operations Research (OR)
- Optimization
- Advanced OR
- Stochastic Modeling & Simulation
- Probability & Statistics
- Supply Chain Management
- Industrial Engg. Systems
- Machine Learning
- Operations Planning and Control
- Project Management

Tools

- Programming (Python/R/C++)
- SQL , MongoDB
- Excel
- Tableau/ PowerBI
- SPSS
- Solvers like CPLEX , Gurobi
- Anylogic
- Matlab
- Google OR Tools



<https://publicsystemslab.in>



About Us

The M.S.(R) (Master of Science (Research)) is a masters-level program similar to a M.Tech. but with a more research-centric approach. Students enrolled in this program enjoy more flexibility regarding the course credit requirements and devote most of their time to active research.

Students enrolled in this program do their projects in mainly four specializations i.e. Thermal, Design, Production and Industrial Engineering. They may also engage in inter-disciplinary research based on their interest. All students graduate with a degree of M.S.(R) in Mechanical Engineering.

Courses & Tools

Same as individual M.Tech programs.
Please refer the documents of individual M.Tech Programs

Areas of Expertise

Same as individual M.Tech programs.
Please refer the documents of individual M.Tech Programs

Mechanical Design:

- Online wear monitoring and Tool Failure Prediction using Machine Learning and Simulation

Thermal Engineering :

- High Entropy Alloys - Nano particles fabrication and characterization study

Production:

- Ultrasonic Joining of EV Batteries

Industrial Engineering :

- ONDC (Open Network for Digital Commerce) for e-commerce and logistics in India.

M.S.(R) MECHANICAL ENGINEERING



About Us



PGDEx-VLFM is a one-year full-time residential executive diploma programme jointly conducted by IIM Mumbai and IIT Delhi to groom the emerging leaders for mid and senior-level Managerial positions.

The products of this programme shall be the change drivers, who would provide the strategic impetus over a wide range of verticals such as Operations & Supply Chain Management, Strategic Planning, Business Excellence, Digital transformation, and Smart Manufacturing. It is a unique programme with a rigorous curriculum to build a pool of techno-managerial leaders who can transform India's manufacturing sector.

The programme thrives on peer-learning pedagogy focusing on management, manufacturing technology and leadership. This programme is designed to enable our participants to be adequately equipped and empowered with knowledge and skillsets to have a competitive advantage in the volatile, complex and dynamic business environment.

In addition, the programme creates a government-industry-academia significantly contributing to the Make in India initiative and making India truly Atmanirbhar.

Programme Vision

To create a distinct set of visionary leaders with the ability to contextualize and contribute to the nation's manufacturing renaissance.

- The Programme strengthens the curriculum with theories, tools, and models of Breakthrough Management and the Five-Step Discovery process with workshop-oriented learning and Industrial visits in India & Abroad.
- It brings about the change in the thought process from small m to big M & provides a vision to look at the invisible through the Third Eye.
- National and the global economies are facing challenges on a scale we haven't seen in nearly a century. Post pandemic, the world is moving towards a new era of manufacturing renaissance.
- The nation is eyeing to become a global leader by increasing the manufacturing sector's contribution to national GDP at a growth rate of 25% by 2025, where the new generation of leaders with a vision to envisage the industry needs and zeal to propel the market will play a pivotal role.

SCOPE OF THE PROGRAM

V.L.F.M MECHANICAL ENGINEERING



Areas of Expertise:

- Manufacturing Strategy
- Operations Research in Manufacturing
- Strategic Planning and Implementation
- Cost Management and Controls
- Managerial Economics
- Data Analytics
- Marketing: Theory and Practice
- Advanced Human Resource Management
- Sustainable Strategies for Manufacturing
- Market Research for Global Manufacturing Competitiveness

Batch Profile



25

Batch Strength

28

Avg. Age



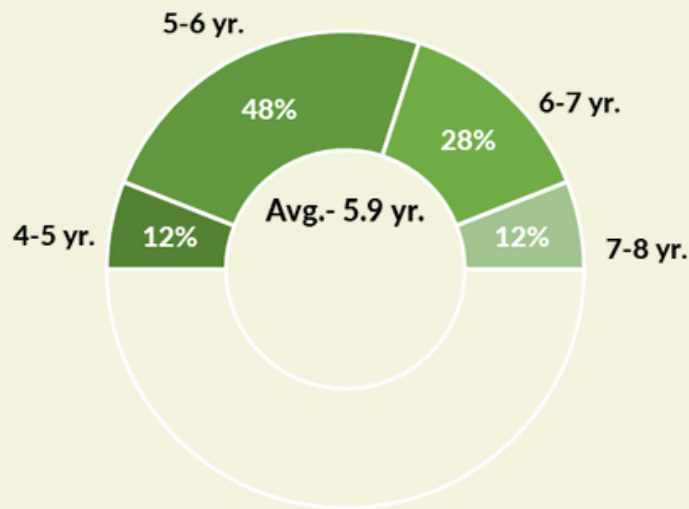
16% 84%

Batch Diversity

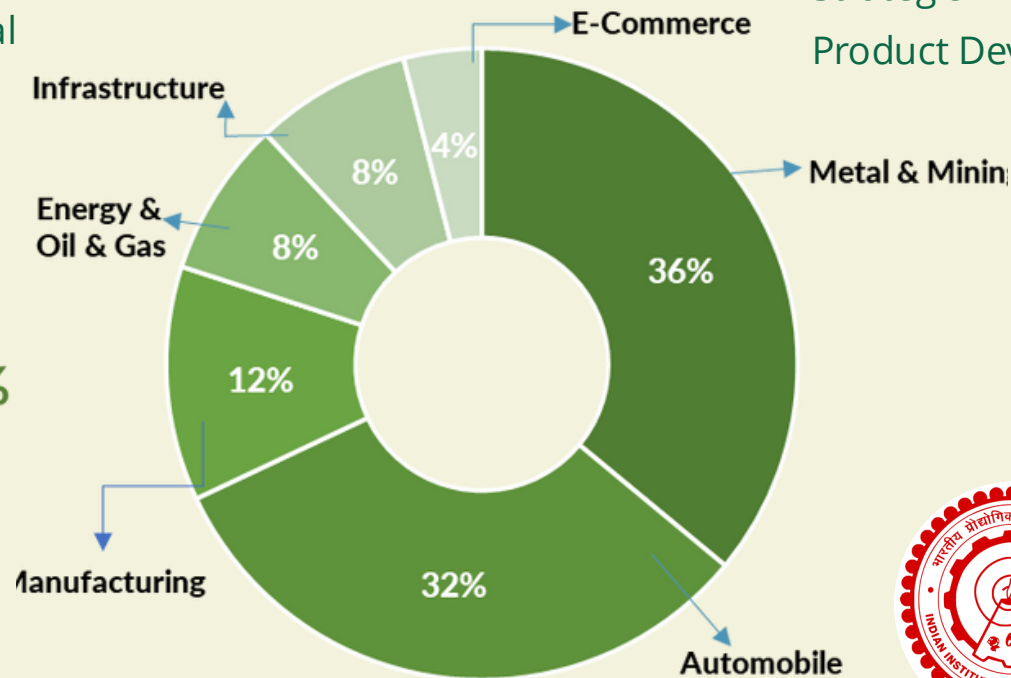
Areas of Expertise:

- Core Manufacturing Processes
- Statistics for Manufacturing Management
- Artificial Intelligence and Machine Learning
- Additive Manufacturing
- Automation and Smart Manufacturing
- Energy Management and Industrial Safety
- Supply Chain, Strategic Sourcing, and Logistics Planning
- Strategic Imperatives of New Product Development

Work Experience



Professional Diversity



Areas of Expertise:

Design Group:

- Finite Element Analysis
- Noise Vibration & Harshness
 - Vibration and Noise Control
 - Condition Monitoring
 - Rotor Dynamics
- Digital Twin of machineries
- Biomedical device & implant design
 - Flexible Manipulators
 - Training module for surgery

Thermofluid Group:

- CFD
 - Heat Transfer
 - Multi-phase flows
 - Droplet/Bubble Physics
- HVAC
- Pollution mitigation strategies
- Energy Storage (Solar/Batteries)
- Nano and Micro-fluidics

Production & Industrial Group:

- Bio-Materials for Implants and Ortho.
- Additive Manufacturing
 - 3D/4D printing
 - Sintering
- Blast Mitigation material system
- Sustainable Supply Chains

Why Us

- PhD in Mechanical Engineering involves a deep understanding of theoretical concepts and applying them to solve complex problems that lie in the Sustainable Development Goals (SDG).
- Three Groups are involved to achieve these goals:
 - Design Group
 - ThermoFluid Group
 - Production & Industrial Group
- The program involves Creative and productive inquiry in the areas of Noise and Vibration, Additive Manufacturing, CFD and Heat transfer, renewable energy, and Resource management.
- Students acquire deep understanding of fundamental technical knowledge, planning and managing resources for conducting industry R&D projects.

Courses

- All courses presented in M.Tech Design, Thermal, Production and Industrial, along with other department courses.

Tools

- Deep understanding and expertise in the FEA and other computing softwares.

PhD Mechanical Engineering



PhD Projects

DESIGN Group

Noise Vibration & Harshness

- Condition monitoring of the wind turbine power train.
- Noise & vibration analysis of Epicyclic gearbox
- Digital twin for the rotor and gearbox systems.

Biomedical Device

- Dynamics of Highly Flexible Manipulators.
- Development of a heterogeneous lung model for blunt impact loads.

THERMOFLUID Group

CFD/Heat transfer

- Investigation of induced flow patterns in flapping wing aerodynamics.
- Modeling fluid flow over patterned and lubricated surface textures.

Solar Energy

- Porous Volumetric Solar Receiver.
- Parabolic Solar Collector

Energy Storage

- Thermal characterization and management of commercial lithium-ion batteries.

HVAC.

- Modeling and performance analysis of V-Bar splash fills-in wet cooling towers.
- Mitigation of air pollution by uncharged and charged droplets

PRODUCTION & INDUSTRIAL Group

Additive Manufacturing

- Development of novel entropy alloys for implants.
- 4D-printed shape memory polymer composite for biomedical applications.

Blast mitigation material system

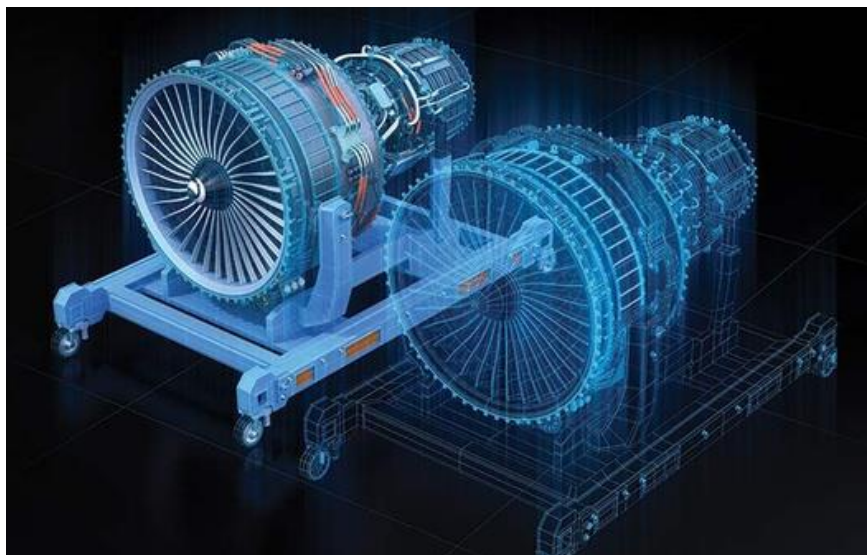
- Material Characterizations under Shock Wave Loading.
- High Strain Rate Material Test Setup.
- Blast Mitigation properties Material

Sustainable energy and resource management

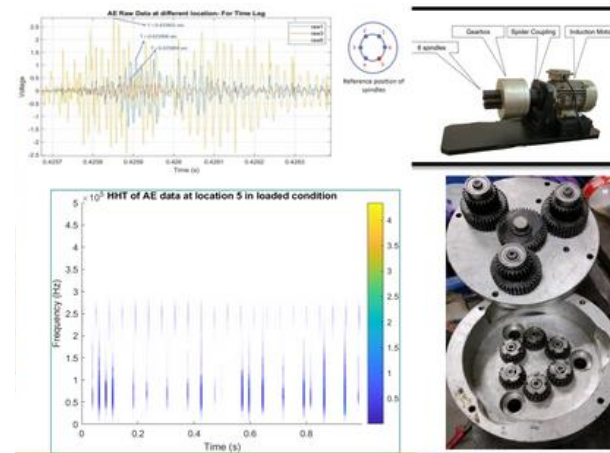
- Reverse Logistics Modeling for Electric Vehicle Batteries.

Design Group

GLIMPSE OF SOME PHD PROJECTS



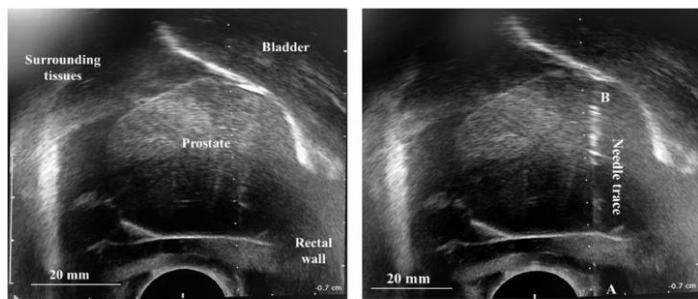
Digital Twin of Rotor system



Noise and Vibration Analysis of Epicyclic Gearbox



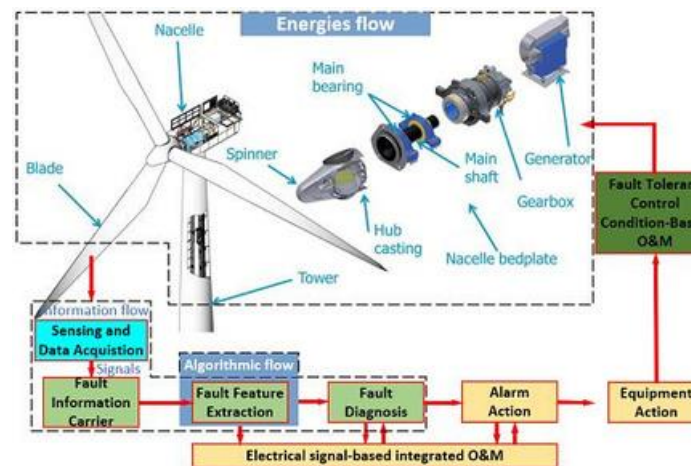
(a)



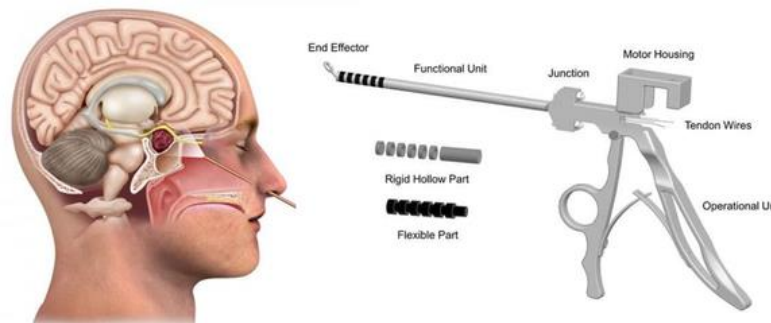
(b)

(c)

Training module for prostate needle biopsy



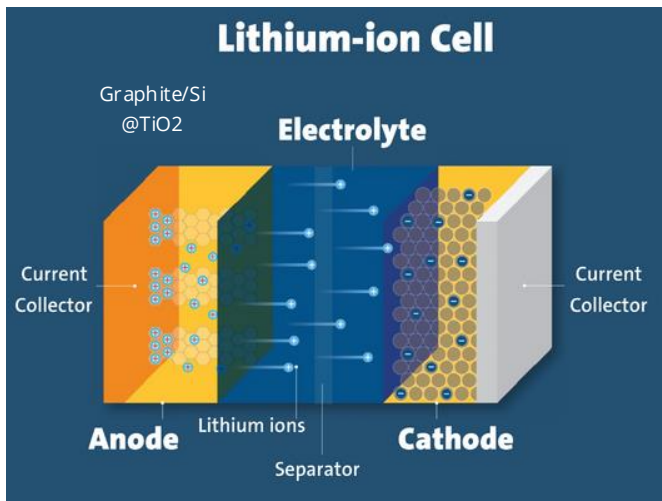
Condition monitoring for Wind Turbine Power Train



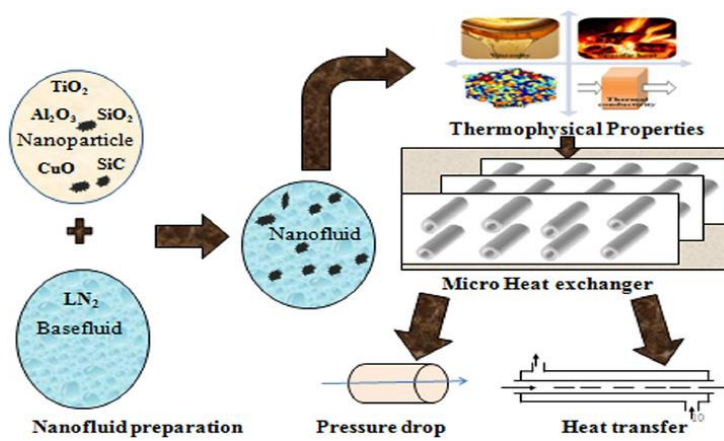
Flexible manipulator for Neurosurgery

Thermal Group

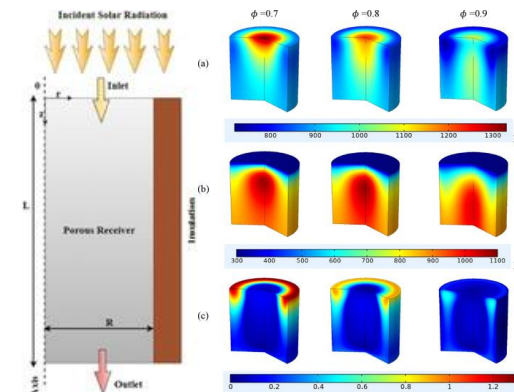
GLIMPSE OF SOME PHD PROJECTS



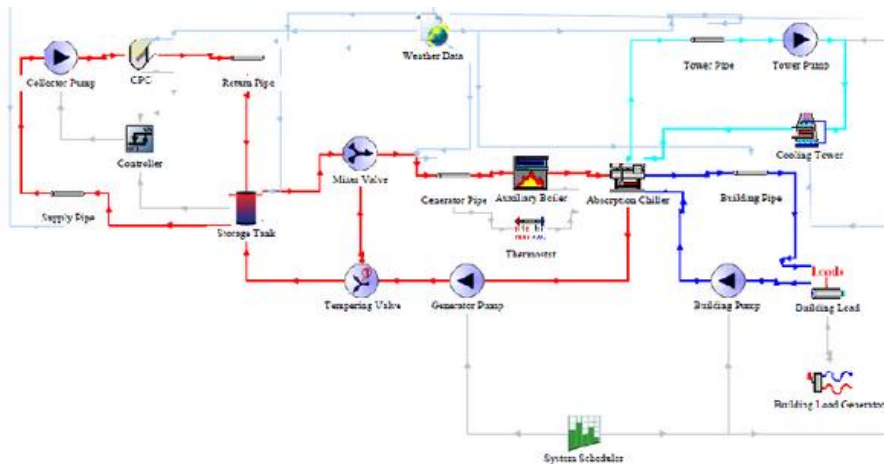
Composite Anode for Li-ion Batteries



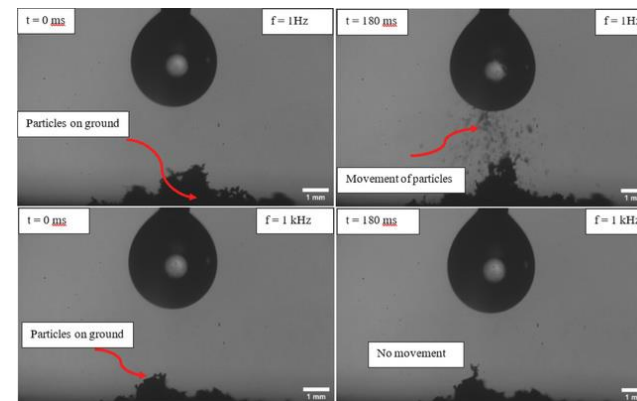
CFD Simulation of micro-heat exchanger



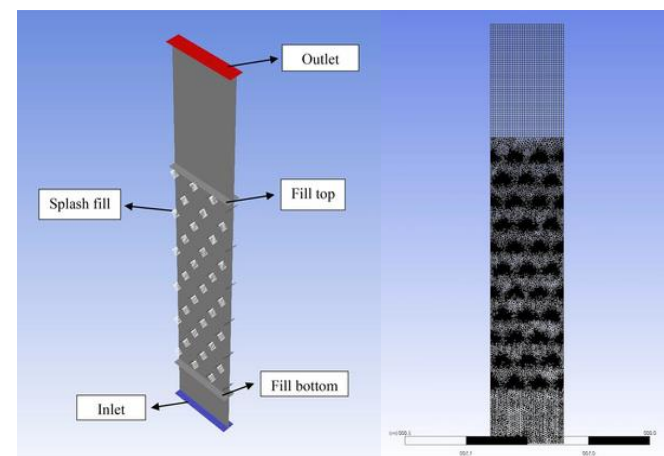
Heat transfer analysis of Porous Solar Receiver



Simulation of Solar Absorption Cooling System

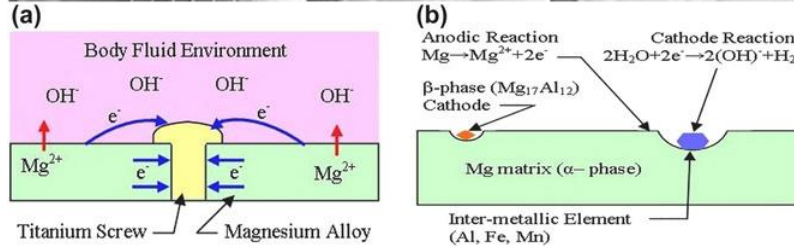
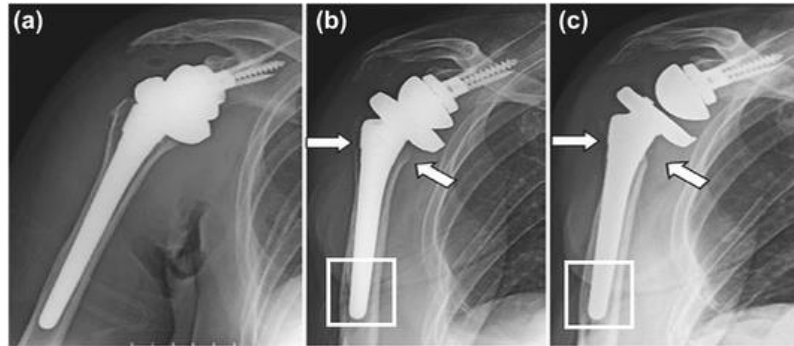


Mitigation of Air Pollution using charged droplets

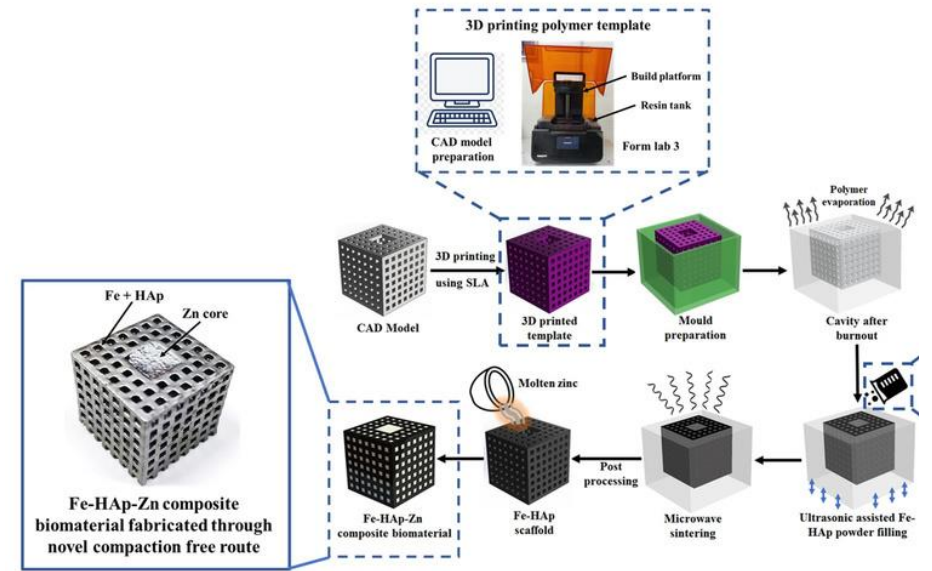


CFD simulation of Wet Cooling towers

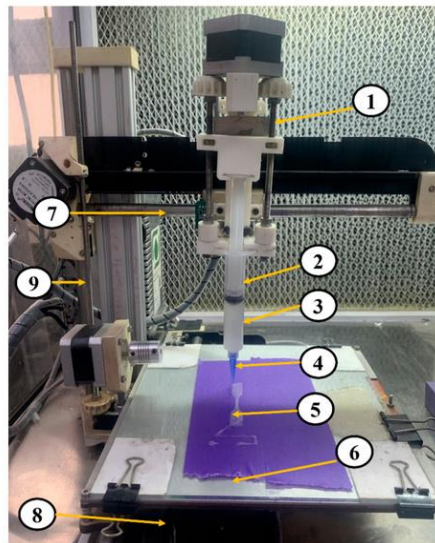
Production & Industrial Group



Fabrication of Magnesium alloys for Implants

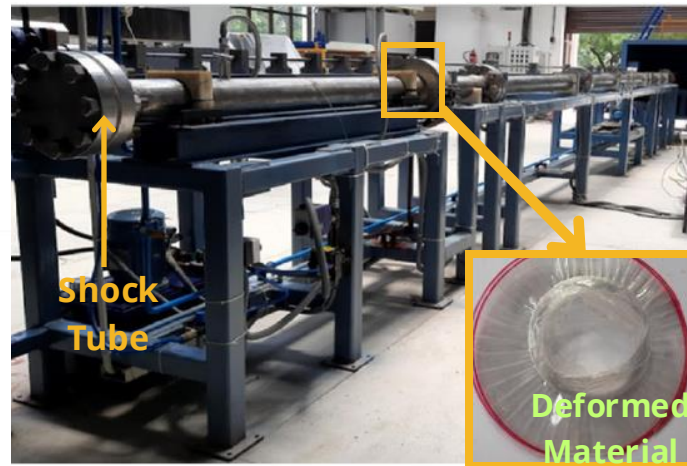


Fabrication of Biodegradable Composite Implants

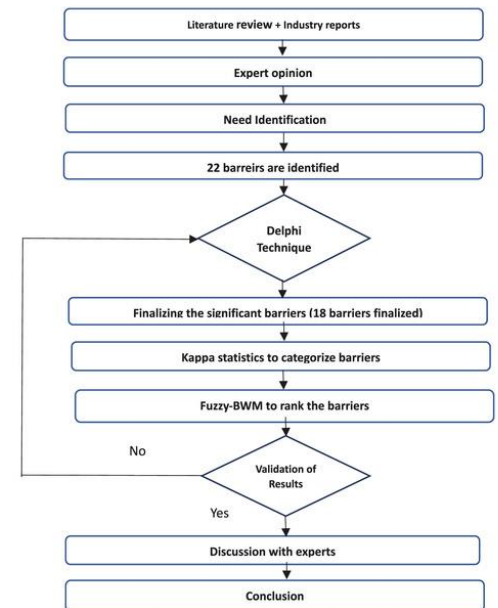


1. Extrusion head
2. Syringe
3. Composite ink
4. Nozzle
5. Printed part
6. Platform
7. X-stage
8. Y-stage
9. Z-stage

4D printed Shape Memory Alloys for Biomedical applications



Blast Mitigation analysis of Materials



Sustainable energy and resource management Framework for EV's Batteries

Mechanical Design



RESEARCH FACILITIES



Shock tube

Shock Tube for high strain test



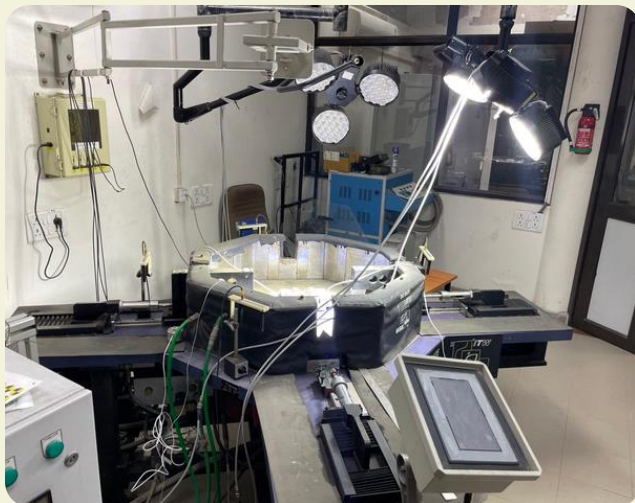
Dextrous Manipulation



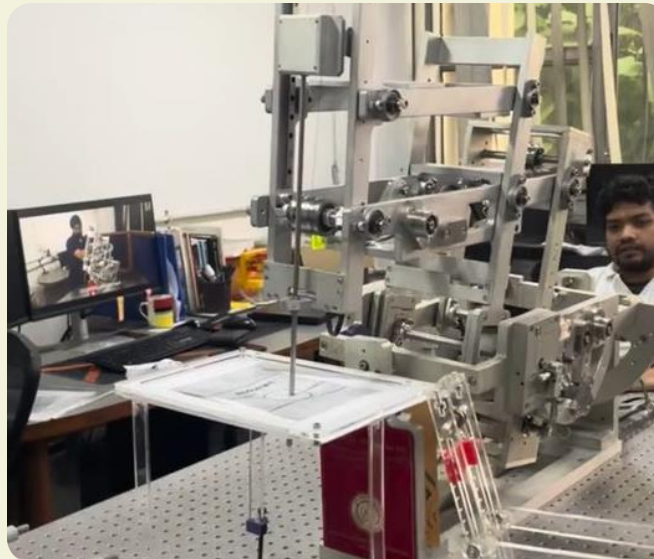
Lifting Test Rig



CT scanner for Implant design



High strain rate axial test system



Robotic Manipulator for MIS



Rheometer

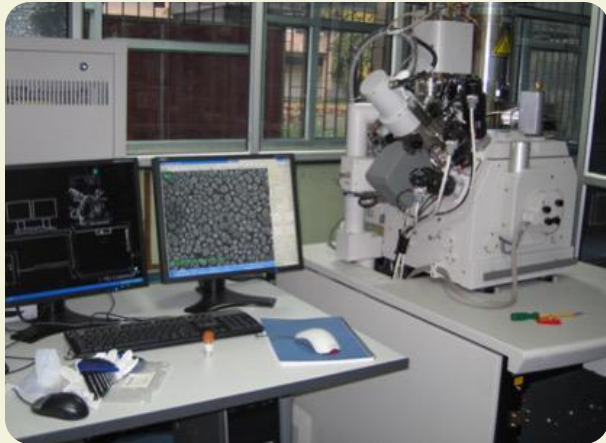


UT M

Production Engineering



RESEARCH FACILITIES



Focused ion beam machining



Micro Machining Systems



10-Axis CNC Turn Mill



Robotic Welding Cell



Cyber Physical Assembly Line



Deep Drawing and Formability Testing Machine



Furnace and Accessories



Bioprinter for biomedical applications



Abrasive Cutter



UT
M

Thermal Engineering



RESEARCH FACILITIES

Thermofluids and Energy Systems Lab



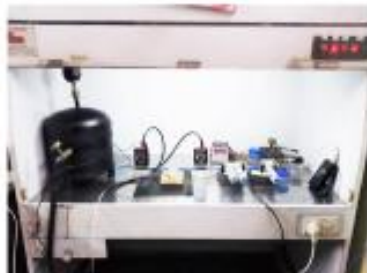
Vacuum glovebox



Thermo-electrochemical characterization of commercial batteries



Battery cycler and frequency response analyser



Flow Test rig for Microchannels

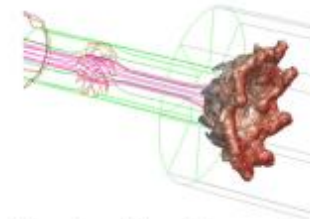


Turbomachinery Lab



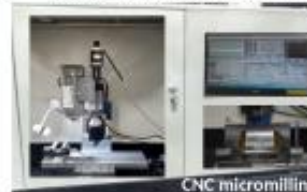
Pool boiling Setup
Heat Transfer Research Lab

Combustion Research Lab



Combustion Dynamics of a turbulent swirling flame

Microfabrication Equipment



CNC micromilling



Hot Air Oven

Vacuum desiccator

Spin coater

Characterization Equipment



Epifluorescence microscopes

Contact angle goniometer

Stereozoom microscope

Syringe pumps

HV Supplies



PMMA



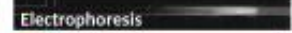
PDMS



Micro PIV



T-sensor



Electrophoresis



EK Instabilities

Micro and Nano-fluidics Laboratory

Industrial Engineering



RESEARCH FACILITIES





Previous Recruiters





Placement Procedure




- 

Interested companies can contact Faculty Coordinator or placement officer, Office of Career Services (OCS) for a Job Notification Form (JNF) at placement@admin.iitd.ac.in
- 

JNF requires the companies to fill in mandatory details of the job profile, role offered, pay package, place of posting, eligible departments.
- 

Once the filled-in-JNF with all the required details is received, companies are assigned username/password to access their online account on OCS website.
- 

Companies are also assigned space on the server on which they may upload any presentation, videos, data or other information they want the students to see
- 

The JNF has to be frozen on the OCS website by the company till a deadline, after which the students shall be able to view all the details, and the eligible students may apply



After the application deadline for the students, the resumes are visible to the company. The company submits a shortlist on its online account before a deadline.



Shortlisted students get notified. The placement office allots the dates for the campus interviews.



After the completion of the selection process on campus, the company is required to announce the final list of the students on the same day itself.



If a student is selected the jois registered against him/her and he/she would not be allowed to appear for more interviews as per placement policy.

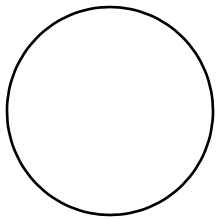
Looking forward to fruitful professional relationship.....Welcome to Campus!

Contact Us



UG/PG Placement : placement@admin.iitd.ac.in
Department Website: <https://mech.iitd.ac.in>

Student Coordinators



Garima Singh

Training and Placement officer,
Office of Career Services

sgarima@admin.iitd.ac.in



Prof. Kaushik Mukherjee

Faculty Coordinator
Dept. of Mechanical Engineering

kmukherjee@iitd.ac.in

- **Professor incharge:** picocs@admin.iitd.ac.in
- **Co- Professor incharge:** cpicocs@admin.iitd.ac.in



Jivant Garg

UG Nucleus Coordinator, OCS
Dept. of Mechanical Engineering

+91 7087638156

me2222074@iitd.ac.in



Rishabh Tripathi

PG Nucleus Coordinator, OCS
Dept. of Mechanical Engineering

+91 8109487923

mep232741@iitd.ac.in



Bhuwan Sardar

PhD Nucleus Coordinator, OCS
Dept. of Mechanical Engineering

+91 8340664794

mez207640@iitd.ac.in



3rd Floor, Synergy Building, IIT Delhi.
Phone: +91-11-2659 1731/32.