Contents

About IIT Mandi

The Indian Institute of Technology Mandi (IIT Mandi), one of the premier technical institutes in India. IIT Mandi was established in 2009 with the aim of providing world-class education and cutting-edge research in engineering, science, and technology. Since its inception, the institute has strived to achieve excellence in education, research, and innovation.

Located in the scenic town of Mandi in the Himalayan foothills, the institute offers a unique learning experience to its students. With state-of-the-art facilities and world-class faculty members, IIT Mandi provides a conducive environment for research and learning. The institute offers undergraduate, postgraduate, and doctoral programs in various disciplines of engineering, sciences, and humanities.

At IIT Mandi, we believe in fostering an environment of innovation and creativity. Our faculty members are renowned experts in their fields and are committed to providing their students with the best possible education. With our multidisciplinary approach to education, we aim to produce graduates who are well-rounded and equipped to solve real-world problems.

We take pride in our research culture and encourage our students to engage in cutting-edge research in various fields. Our research facilities are equipped with state-of-the-art equipment and resources, providing our students with ample opportunities to explore their interests and pursue their passions.

Institute Webpage: www.iitmandi.ac.in

About IIT Jammu

The plan to establish IIT Jammu, along with four other IITs in Chhattisgarh, Goa, Andhra Pradesh, and Kerala, was announced by the Hon'ble Finance Minister in the Union Budget 2014-15.

The Indian Institute of Technology Jammu was inaugurated on 6th August 2016, and welcomed the first batch of students into the campus in Paloura, Jammu. In the initial phases, the establishment of IIT Jammu was done under the mentorship of IIT Delhi.

In 2018, IIT Jammu shifted its primary operations to the 400 acres of lush green land in Jagti village, just outside Jammu city, provided by the Government of Jammu and Kashmir for establishing its main campus. Currently, Phase 1A of the main campus, spread across 25 acres, is operational. Phase 1B and 1C are undergoing rapid construction. The main campus of the Institute is located on National Highway–44, 17 km from the Jammu Airport and 19 km from the Jammu Tawi Railway Station.

The campus in Paloura now accommodates PhD scholars. It also houses the high-end research facility: Central Instrumentation Facility (CIF or SAPTARSHI Labs), equipped with highly sophisticated state-of-art instruments to enable researchers in basic sciences and engineering.

Institute Webpage: https://www.iitjammu.ac.in/

About PhD JDP

The Joint Degree Program (JDP) offers PhD students enrolled in both institutions the chance to collaborate on a multidisciplinary research project with faculty members and research teams from IIT Mandi and IIT Jammu, as well as to take advantage of the facilities and professional development opportunities offered by both institutions.

Important Guidelines for PhD Application

1. Please read the instructions given in the brochure carefully before filling up the applications.
2. Online Application form link & Information brochure (Including the admission schedule along with the important dates) is available on the institute website at the following link: https://alliance.iitmandi.ac.in/iitjammu/
3. You are required to submit the application form ONLINE. No Downloadable Forms will be available after filling the form, you are advised to take a print of your application for your records.
4. For each project, candidate should submit a separate application with the application fee.
5. The application fee is as follows:

Category	Amount in ₹
General/EWS/OBC/OBC(NCL)/Transgender/Foreign Nationals	200
Women/SC/ST/PD	100

   a. One application fee is valid for the single application. The application fee is **NON-REFUNDABLE**.

6. OBC candidates may note that the limit for annual income is Rs. 8 Lakhs for determining the creamy layer among Other Backward Classes (OBCs) candidates. The OBC (NCL) certificate issued for the financial year 2026-27 by the Competent Authority in the prescribed format must be uploaded in the ONLIINE application form. ***(certificate issued after 31st March,2026)***
7. Economically Weaker Sections (EWS) candidates may note that the limit for annual income is Rs. 8 Lakhs for determining the eligibility for benefit under Economically Weaker Sections (EWS) reservation. The EWS certificate issued by the Competent Authority in the prescribed format must be uploaded in the ONLINE application form and submitted at the time of admission. ***(Certificate issued after 31st March,2026)***
8. Seats are reserved for Economically Weaker Sections (EWS) / Other Backward Class Non-Creamy Layer (OBC-NCL) / Schedules Caste (SC) / Scheduled Tribe (ST) and Person with Benchmark Disability (PwD) categories as per Government of India norms.
9. You should check Institute website for results / important announcements.
10. You should check emails sent to your email address provided in your application for all important communications and announcements if any.

11. Merely fulfilling eligibility criteria does not entitle a candidate to be called for the written test/interview. Decision of Institute authorities will be final. Admission is based on GATE / Written test / Interview performance in addition to general eligibility criterion, the applicants must also satisfy the eligibility criteria specified for the respective Departments / Centres / Schools / Interdisciplinary Groups.
12. Candidates, if called for written test/interview should show/ bring with them (i) Photo ID Card, (ii) Printed copy of the application submitted online, (iii) Thesis / dissertation / report / publications (iv) copy of certificates and mark-sheets.

Important Dates for Admission

Starting date for filling Online Application	30th June, 2026
Last date for filling Online Application	10th July, 2026 (05: 00PM)
Declaration of shortlisted candidates list	Will be Published on IIT Mandi and IIT Jammu website
Shortlisted candidates will be informed by email	

Contact Details

In case of any query related to the Ph.D. Programme admission process you may contact respective school / Centre, the contact details are:

IIT Mandi

Name of School/Centre	Email ID	Contact No.
Centre Artificial Intelligence and Robotics (CAIR)	cairoffice@iitmandi.ac.in,	----------
School of Biosciences & Bioengineering	sbboffice@iitmandi.ac.in	01905-267061
School of Chemical Sciences	scsoffice@iitmandi.ac.in	01905-267277
School of Civil & Environmental Engineering	scene_admissions@iitmandi.ac.in	01905-267180
School of Computing and Electrical Engineering	sceeoffice@iitmandi.ac.in	01905-267071
School of Humanities & Social Sciences	shssoffice@iitmandi.ac.in	01905-267719
Indian Knowledge System and Mental Health Application (IKSMHA)	iksmha@iitmandi.ac.in	01905-267786
School of Management	somoffice@iitmandi.ac.in	01905-267119
School of Mathematical & Statistical Sciences	smssoffice@iitmandi.ac.in	01905-267929
School of Mechanical and Materials Engineering	smmeadmissions@iitmandi.ac.in	01905-267138
School of Physical Sciences	spsoffice@iitmandi.ac.in	01905-267812
Centre for Quantum Science and Technologies (CQST)	arvindthapliyal@iitmandi.ac.in	01905-267899
Centre for Human Computer Interaction (CHCI)	chcioffice@iitmandi.ac.in	01905- 267187
Centre for Climate Change and Disaster management	c3dar-office@iitmandi.ac.in	-

IIT Jammu

Name of School/Centre /Department	Email ID
Department of Biosciences and Bioengineering	hod.bsbe@iitjammu.ac.in
Department of Chemical Engineering	hod.chemical@iitjammu.ac.in
Department of Chemistry	hod.chemistry@iitjammu.ac.in
Department of Civil Engineering	hod.ce@iitjammu.ac.in
Department of Computer Science and Engineering	hod.cse@iitjammu.ac.in
Department of Electrical Engineering	hod.ee@iitjammu.ac.in
Department of HSS	hod.hss@iitjammu.ac.in
Department of Materials Engineering	hod.materials@iitjammu.ac.in
Department of Mathematics	hod.mathematics@iitjammu.ac.in
Department of Mechanical Engineering	hod.me@iitjammu.ac.in
Department of Physics	hod.physics@iitjammu.ac.in

Academic Structure

Program management

A Doctoral Advisory Committee (DC) shall be set up for each JDP Scholar to support and monitor progress of the JDP Scholar throughout the candidature until the thesis has been submitted. The DC shall consist of the following members.

Chair/Head of the School/Department of the Home Institute or his/her nominee	Chairperson
Supervisor from the Home institute	Member
Supervisor from the Host institute	Member
Co-supervisor (s), if any with justification	Member (s)
Subject Expert from the Home Institution	Member
Additional members may be appointed to meet the requirements	Members

Coursework Requirements

The JDP Scholar shall satisfy the minimum academic coursework requirements of the Home Institution. Additional courses may be taken when recommended by the DC. If a JDP scholar credits a course in one institution, the credits will be automatically transferred to the other institution and will be counted towards the degree requirement.

Joint Degree Program Structure

- Candidates have a **"Home Institution"** where they begin their studies and spend the majority of time. The expectation is that candidates will spend a minimum of 12 months at the other, **"Host Institution"** the timing and duration of this will depend on the program

of research but in general will be in the second or third year of the degree. Travel to and study at the Host Institution will be subject to the usual requirements of the institute.

- As a condition of enrolment on the PhD JDP, candidates are required to:
  - Spend a minimum of one year* (two semesters) enrolled at each institution.
    *Candidates registered as part-time PhD or under External Registration program need to spend the minimum residential requirement criteria of both the institute as mentioned in their ordinances and regulations.
  - Undertake a program of progress monitoring and examination that meets the requirements of both institutions.
  - Comply with the rules, regulations, policies, codes and procedures of both institutions.
  - Write and submit a thesis for defense by oral examination at the home Institution.

- Candidates for the PhD JDP will be enrolled in a PhD program in parallel at both institutions. The supervisory team will comprise academics from both institutions who will provide guidance and support throughout the doctoral program. Candidates will benefit from the research community, networking, and collaborations of the IIT Mandi – IIT Jammu. Through enrolment at both institutions, candidates will have access to services and support provided at IIT Mandi and IIT Jammu, including a variety of professional and personal development opportunities for researchers.
- The primary supervisor shall be from the Home Institution. There must be a Joint supervisor from the Host Institution.
- The PhD JDP includes a tailored program of progress monitoring to fulfil the requirements of both institutions. On successful completion of the program requirements, candidates will be awarded a PhD degree jointly by both the Institutions.

Admissions are currently open under the following research projects:

<table>
<tr><td rowspan="3">1.</td><td colspan="2">Project Title.

Bridging Credit Gaps in Agriculture : Financial Inclusion and Rural Growth</td></tr>
<tr><td colspan="2">Climate change poses a growing threat to global agricultural productivity, especially in low-and middle-income countries where smallholder farmers remain highly susceptible to environmental risks such as droughts, floods, and shifting weather patterns. Enhancing the resilience of agriculture, therefore, requires not only the implementation of climate-smart farming practices but also strong financial systems. In this context, both monetary policy and financial inclusion serve as essential mechanisms for promoting climate adaptation and strengthening sustainable livelihoods in these economies.
Monetary policy directly affects the affordability and accessibility of financial capital, primarily through interest rate adjustments and credit regulation, and liquidity management. When central banks adopt accommodative policies, such as low interest rates or implementing sector-specific lending initiatives, they can encourage banks to extend greater credit to agriculture. This, in turn, enables investments in adaptive technologies like drip irrigation, drought-resistant seeds, or early warning systems.
At the same time, financial inclusion ensuring individuals and small-scale producers have access to useful and affordable financial services is key to empowering farmers. However, millions of smallholders remain unbanked or underbanked, limiting their ability to borrow, save, or insure against climate shocks. Expanding financial access through mobile banking, agricultural microcredit, and insurance instruments empowers farmers to adopt adaptive innovations and recover more quickly from climate-related losses.
Central banks and financial authorities further contribute by fostering inclusive green finance policies that encourage credit provision in underserved rural areas and by endorsing financial technology solutions that extend outreach to remote communities. Some countries have even begun integrating climate risk into monetary frameworks, recognizing that climate change is a long-term threat to economic and price stability.</td></tr>
<tr><td>Home Institute: Indian Institute of Technology Mandi

Supervisor: Dr. Masudul Hasan Adil

School/Dept.: SHSS</td><td>Host Institute: Indian Institute of Technology Jammu

Supervisor: Dr. Hardeep Singh

School/Dept.: HSS</td></tr>
<tr><td rowspan="2">2.</td><td colspan="2">On-chip Radiation Hardened In-Memory Computing for Edge device applications</td></tr>
<tr><td colspan="2">This proposal targets the development of radiation-hardened in-memory computing (IMC) architectures in state-of-the-art CMOS technologies, where aggressive scaling to FinFET/GAAFET nodes has amplified vulnerability to radiation-induced disturbances such as single-event upsets, transients, and cumulative dose effects. The work will investigate robust memory-compute primitives and array organizations that preserve computational accuracy under particle strikes while retaining the density and energy advantages of IMC. Key directions include hardened bit-cell and compute-in-SRAM/FeRAM structures using radiation-aware layout and device sizing, resilient sensing and accumulation circuits with redundancy and error-correcting capability, and architecture-level fault monitoring with adaptive reconfiguration for graceful degradation. Prototype IMC macros will be designed in advanced CMOS nodes and assessed through radiation-effect simulation and experimental irradiation, enabling quantitative comparison of reliability, energy efficiency, and compute fidelity. The expected outcome is a set of radiation-tolerant IMC</td></tr>
</table>

	design techniques and validated silicon demonstrators suitable for dependable edge and spaceborne processing in modern nanoscale CMOS.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Prof. Hitesh Shrimali **School/Dept.:** School of Computing and Electrical Engineering	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Ambika Prasad Shah **School/Dept.:** Department of Electrical Engineering
3.	**An Adaptive Computational Framework for Fracture in Piezoelectric, Flexoelectric, and Magnetoelectric Materials**	
	Smart materials such as piezoelectric, flexoelectric, and magnetoelectric systems exhibit strong coupling between mechanical, electric, and magnetic fields, enabling advanced applications in sensing, actuation, energy harvesting, and adaptive structures. However, their inherent brittleness and multiphysics interactions make fracture prediction highly challenging, particularly under complex loading environments. This project proposes the development of an adaptive phase-field modeling framework to investigate fracture in smart materials and their composites. The approach will capture crack initiation, propagation, and branching within fully coupled multiphysics formulations. Adaptive mesh refinement strategies will be integrated to enhance computational efficiency while preserving accuracy, enabling robust and scalable simulations of fracture in next-generation multifunctional smart structures.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Dr. Raj Kiran **School/Dept.:** SMME	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Roshan Udaram Patil **School/Dept.:** Mechanical Engineering
4.	**End-to-End Hardware Development of Sub-Nyquist Sampling-based Wideband Spectrum Sensor for Sustainable Spectrum Utilization**	
	This research work deals with the design of efficient analog/mixed-signal circuitry along with algorithm and digital architecture designs for wideband spectrum sensing. It spans from concept to chip-level implementation and characterization of the complete hardware prototype. This project will play significant role in enhancing the spectrum utilization of edge devices for the evolving wireless communication systems.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Dr. Rahul Shrestha **School/Dept.:** School of Computing and Electrical Engineering	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Rohit B. Chaurasiya **School/Dept.:** Department of Electrical Engineering
5.	**Model-Free Adaptive Control of Power Electronic Converters for Electric Vehicle Charging Systems**	
	This project focuses on developing model-free adaptive control strategies for power electronic converters used in electric vehicle charging systems. Unlike conventional approaches that rely on accurate system modelling, the proposed method adapts in real time to variations in grid conditions, battery characteristics, and load uncertainties. The objective is to enhance charging efficiency, robustness, and operational stability under practical operating environments. The	

	research will address bidirectional power flow, fast dynamic response, and resilience against parameter drift and disturbances. The outcomes are expected to support reliable and intelligent EV charging infrastructure suitable for future smart grid and vehicle-to-grid applications.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Prof. Dipankar Deb **School/Dept.:** Centre for AI and Robotics (CAIR)	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Arun K Verma **School/Dept.:** Department of Electrical Engineering
6.	**The role of RNA in nucleosome dynamics and positioning**	
	In live cells, RNAs are constantly associated with chromatin. There is rising evidence suggesting that RNA may be actively involved in nucleosome organization with or without the help of remodeling enzymes. Yet, most researchers have always focused on remodeling enzymes, transcription factors, and the DNA sequence as the main drivers for nucleosome positioning. The exact role of RNA in nucleosome-based cellular activities is not clear. Here, we want to study how different RNAs (non-codoning and well as coding) interact with nucleosomes and affect positioning and genome organization. Approaches: a) Analysing and predicting RNA bound genomic sites using available public data, genomics, and bioinformatics tools. b) Biophysical modeling of nucleosome dynamics in the presence of RNA. Here we study how nucleosomes and RNA interact using molecular dynamics simulations and Monte Carlo simulations. Expected outcome: a) Fundamental understanding of the role of RNA in nucleosome positioning. b) Development of AI/ML-based bioinformatics tools. b) Prediction of RNA-based therapeutic targets and drugs.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Dr. Kharerin Hungyo **School/Dept.:** Biosciences and Bioengineering	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Ajeet Kumar Sharma **School/Dept.:** Bioscience and Bioengineering
7.	**Analysis of driven piles using an integrated numerical-experimental approach**	
	Pile driving is one of the extensively used techniques adopted for the installation of displacement piles. Such driven piles can be found in several geotechnical applications involving infrastructural development, such as foundation support, retaining walls, and bridge construction to name a few. However, this method of pile installation often leads to alteration of stress-strain and density state of the surrounding soil. Further, the residual stresses developed during the pile driving can significantly impact the load capacity of such piles. The proposed study envisions to investigate the load capacity of driven piles with due consideration to the developed residual stresses during pile driving through numerical simulations, and extensive lab and field scale study.	
	Home Institute: Indian Institute of Technology Mandi **Supervisor:** Dr. Mousumi Mukherjee **School/Dept.:** School of Civil and Environmental Engineering	**Host Institute:** Indian Institute of Technology Jammu **Supervisor:** Dr. Prasun Halder **School/Dept.:** Department of Civil Engineering
8.	**Sequenced Active Fault Management for Resilient Microgrid**	

	Due to the infeed effect of inverter based renewable (IBR) energy sources into the grid, the primary overcurrent relay sees high current whereas the backup relay sees low current for downstream faults. This leads to error in coordination of overcurrent relays in the network. To resolve this issue, there is a requirement to change the protection relay characteristic that goes with control logic. However, changing the relay characteristic at all network locations is not a feasible solution. This research will focus on development of an active fault management feature in the controller which will be activated during the fault such that the IBR output aligns with the existing relaying principle. A fault management component will be added in parallel with the existing control algorithm. This research work will propose a sequence active fault management control framework for microgrids with fault ride through capability. The controller will be formulated to generate positive as well as negative sequence currents of renewable energy sources under unbalanced faults. In such a way, the proposed controller can significantly improve system resilience regarding the fault current contribution.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Priyanka Mishra **School/Dept.:** Electrical Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Dr. Pratim Kundu **School/Dept.:** Computing and Electrical Engineering
9.	**Design and Development of Dual Functional Materials based-Reactors for Integrated CO_2 Capture and Utilization**	
	The aim is to design and develop dual-functional material (DFM)–based reactors for integrated CO2 capture and utilization, combining adsorption and catalytic conversion within a single intensified reactor. The research will focus on the synthesis and characterization of dual-functional materials, a detailed investigation of their adsorption–reaction mechanisms, and the development of a fixed-bed reactor configuration optimized for the simultaneous capture and conversion of CO2 into value-added products. Multiscale modeling—encompassing material-level kinetics using molecular simulations, reactor-scale CFD simulations, and process-level optimization—will help experimental design and the selection of operating conditions. The outcome will be a comprehensive framework for DFM-based reactor design enabling efficient, compact, and energy-integrated CO2 utilization technologies.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Ashutosh Yadav **School/Dept.:** Chemical Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Venkata Krishnan **School/Dept.:** School of Chemical Sciences
10.	**Monetary Policy and Financial Inclusion: Catalysts for Climate-Resilient Agriculture**	
	Climate change poses a growing threat to global agricultural productivity, especially in low-and middle-income countries where smallholder farmers remain highly susceptible to environmental risks such as droughts, floods, and shifting weather patterns. Enhancing the resilience of agriculture, therefore, requires not only the implementation of climate-smart farming practices but also strong financial systems. In this context, both monetary policy and financial inclusion serve as essential mechanisms for promoting climate adaptation and strengthening sustainable livelihoods in these economies. Monetary policy directly affects the affordability and accessibility of financial capital, primarily through interest rate adjustments and credit regulation, and liquidity management. When central banks adopt accommodative policies, such as low interest rates or implementing sector-specific lending initiatives, they can encourage banks to extend greater credit	

	to agriculture. This, in turn, enables investments in adaptive technologies like drip irrigation, drought-resistant seeds, or early warning systems. At the same time, financial inclusion ensuring individuals and small-scale producers have access to useful and affordable financial services is key to empowering farmers. However, millions of smallholders remain unbanked or underbanked, limiting their ability to borrow, save, or insure against climate shocks. Expanding financial access through mobile banking, agricultural microcredit, and insurance instruments empowers farmers to adopt adaptive innovations and recover more quickly from climate-related losses. Central banks and financial authorities further contribute by fostering inclusive green finance policies that encourage credit provision in underserved rural areas and by endorsing financial technology solutions that extend outreach to remote communities. Some countries have even begun integrating climate risk into monetary frameworks, recognizing that climate change is a long-term threat to economic and price stability. Given this introduction, the proposal will examining the financial habits of agricultural households, to examine how monetary policy instruments can support climate-resilient agricultural investments, and assess how financial inclusion improves farmers' adaptation and income stability.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Hardeep Singh **School/Dept.:** Humanities and Social Sciences	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Dr. Masudul Hasan Adil **School/Dept.:** SHSS-Economics
11.	**Addressing bioremediation of water pollutants using advanced metagenomics applications**	
	Bioremediation of wastewater pollutants is being transformed through advanced metagenomic applications and gene knock-out techniques. Metagenomics enables detailed profiling of microbial communities in wastewater treatment plants, uncovering novel genes and pathways involved in breaking down contaminants such as hydrocarbons, pesticides, and heavy metals. Gene knock-out methods validate the functional importance of these genes, allowing researchers to eliminate non-essential pathways and enhance degradation efficiency. This combined approach not only improves microbial strain engineering but also ensures more effective pollutant removal in complex wastewater environments. Together, these innovations pave the way for sustainable, precise, and optimized wastewater bioremediation strategies. Through collaboration with Prof. Tulika at IIT Mandi would enable the objectives completion via her expertise in the field of metagenomics applications while Dr. Pratik from IIT Jammu will provide his expertise in biological wastewater treatment system and bioreactor kinetics. The joint collaboration will help the PhD scholar in effectively completing his/her work objectives.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Pratik Kumar **School/Dept.:** Civil Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Tulika Prakash Srivastava **School/Dept.:** School of Basic Sciences
12.	**Project Title.** **Development of Phase-Field Model to Analyse Fatigue Fracture in Additively Printed Materials under Hydrogen Embrittlement in In-situ and Ex-situ Environments**	
	Hydrogen, the lightest and most abundant element, can easily enter and diffuse through materials due to its small atomic size. In steels, this leads to hydrogen embrittlement (HE), which poses a serious threat to structural integrity by reducing ductility, strength, and fracture toughness while accelerating crack growth. Its severity depends on hydrogen concentration, influenced by factors	

	such as pressure, temperature, flux, and exposure time. Since Johnson's 1864 observation of ductility loss in iron after hydrogen charging, extensive studies have documented these detrimental effects. Steels used in hydrogen storage and transportation pipelines and tanks are particularly vulnerable to HE, leading to degradation, reduced service life, and safety risks. HE also threatens steels used in defence, transportation, and construction. Moreover, the effect of HE on additively manufactured (AM) materials, now widely used in these sectors, remains underexplored. HE arises from various sources, including manufacturing processes, electrochemical reactions, corrosion, and high-pressure hydrogen exposure. Thus, ensuring structural integrity in hydrogen environments requires comprehensive understanding and mitigation of HE mechanisms. While experimental studies are essential to investigate HE, they are time-consuming, costly, and limited in capturing complex microstructural interactions. Numerical modelling has emerged as a powerful complementary tool to simulate hydrogen diffusion, crack growth, providing insights into interactions with microstructure and loading conditions. Such models enable improved material design and safer applications. Phase-field modelling (PFM) has gained prominence in HE research due to its ability to simulate crack initiation, growth, and coalescence without requiring pre-defined cracks, as it is based on energy minimisation. PFM handles crack efficiently and extends seamlessly from 2D to 3D analyses. In HE studies, PFM integrates damage mechanics with hydrogen diffusion to model complex crack patterns. However, most studies focus on the HEDE mechanism; some combine PFM with strain gradient plasticity to include plasticity effects, but often neglect hydrogen's direct influence on plasticity, limiting HELP mechanism representation. Few studies include hydrogen trapping, typically using simplified diffusion models. Integrating PFM with GTN models could improve simulation accuracy for ductile fracture and HE, enhancing understanding of steel failure under hydrogen environments. Currently, we are conducting experimental investigations on the effects of hydrogen environments on super duplex stainless steel. Building on my PhD work in multiscale PFM and ongoing experiments, I propose to develop a comprehensive PFM to analyse crack growth in additively manufactured steels under hydrogen embrittlement in in-situ and ex-situ environments, further extending it to simulate fatigue crack growth and model synergistic HEDE and HELP interactions.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Roshan Udaram Patil **School/Dept.:** Mechanical	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Dr. Raj Kiran **School/Dept.:** School of Mechanical and Materials Engineering
13.	**Development and Testing of Catalyst for pyrolysis of bio-oil upgradation**	
	India, as a predominantly agro-based economy, generates substantial quantities of agricultural residues, a significant fraction of which is either underutilized or openly burned, leading to environmental and energy losses. Thermochemical conversion via pyrolysis offers a promising pathway for valorizing such biomass into energy-dense products, including syngas, bio-oil, and biochar. However, the direct application of bio-oil as a fuel is limited due to its high oxygen content, instability, and poor calorific value, necessitating efficient upgrading strategies. This study proposes the development of novel catalytic systems for the upgrading of crude bio-oil to meet fuel-grade specifications. Emphasis is placed on the design and synthesis of advanced nanostructured catalysts comprising tailored combinations of metallic and semiconductor components to enhance deoxygenation, cracking, and reforming reactions. The catalytic performance will be systematically evaluated under both in-situ and ex-situ pyrolysis configurations to establish structure–activity relationships and optimize process conditions. The integration of catalytic pyrolysis with process intensification strategies is expected to significantly improve bio-oil quality while maintaining high energy efficiency. The outcomes of this work aim to	

	provide a scalable and sustainable route for converting agricultural waste into value-added fuels, contributing to circular bioeconomy development and reduced environmental impact.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Gaurav Ashok Bhaduri **School/Dept.:** Chemical Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Venkata Krishnan **School/Dept.:** School of Chemical Science
14.	**Engineered lattice frameworks with better fracture and fatigue resistance for structural applications**	
	The project aims to investigate the crack growth under static and cyclic loading in lattice metamaterials designed for resilient infrastructure. While architected lattices offer high strength-to-weight ratios and seismic damping, there is a need to study crack growth and fatigue behaviour of these structures. This work involves determining fracture toughness and monitoring fatigue crack growth experimentally in lattice metatmaterials and develop numerical model for better fracture and fatigue resistance.	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Pervaiz Fathima Khatoon M. **School/Dept.:** Civil Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Mohammad Talha **School/Dept.:** School of Mechanical and Materials Engineering
15.	**Machine Learning Driven Approaches for Submodular Function Maximization with Applications**	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Suman Banerjee **School/Dept.:** Computer Science and Engineering	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Manoj Thakur **School/Dept.:** School of Mathematical and Statistical Sciences
16.	**Photochemical Isomerization and Cycloaddition of Alkenes/Allenes**	
	Photochemical isomerization of non-activated alkenes and allenes will be investigated by employing organic and inorganic photocatalysts. The research theme also investigates the photochemical driven intra- and intermolecular cycloaddition reactions of pharmaceutically relevant drug-like molecules containing alkenes and allenes, especially with an emphasis on asymmetric catalysis	
	Home Institute: Indian Institute of Technology Jammu **Supervisor:** Dr. Guru Brahamam Ramani **School/Dept.:** Chemistry	**Host Institute:** Indian Institute of Technology Mandi **Supervisor:** Prof. Pradeep C. Parameswaran **School/Dept.:** School of Chemical Science

General Qualifications

In the present call, the students for the PhD JDP will be admitted only in the Regular category. An eligible student in this category works full-time and receives assistantship from the Institute.

The candidate should fulfil the minimum eligibility criteria of the Home institution of the respective projects as mentioned in the below link.

IIT Mandi : https://cloud.iitmandi.ac.in/f/ebee554e7294407399ce/

IIT Jammu: https://iitjammu.ac.in/Programme/phdadmissions/2023-24/PhD%20Advertisment%20Special%20Drive.pdf

In addition to general eligibility criterion, the applicants must also satisfy the eligibility criteria specified for the respective Projects/Departments / Centres / Schools / Interdisciplinary Groups. Over and above the general eligibility criteria for admission, candidates need to satisfy additional criteria for financial support / fellowship, as specified under specific admission categories.

The final selection process to Ph.D. JDP programme for any project will be through written test and/or interview.

Application and Admissions

The admissions process will be managed by the IIT Mandi - IIT Jammu Joint Admissions Sub-committee (JASC) constituted at the School/Department/Centre level and according to each Institution's admissions procedure. Candidates must meet the admissions requirements of both institutions. The eligibility criteria for enrolling in a joint PhD program will be same as that of a regular PhD program/ERP of the individual institute. The details of the same can be found in the PhD ordinance of the individual institute.

- IIT Mandi https://www.iitmandi.ac.in/pdf/ordinances/Ordinances_phd_mtech.pdf
- IIT Jammu https://iitjammu.ac.in/academics/academics-rules-and-regulations

All applicants will be expected to apply through an online admissions portal.

Fees, Scholarships and Funding

- The JDP Scholar shall pay tuition fees only to their Home Institution throughout the duration of the JDP including the duration of study at the Partner Institution as per its fee structure.

- Unless otherwise indicated, candidates who wish to be admitted onto the PhD JDP are entitled to receive fellowship meeting the eligibility criteria. The cost of fellowship will be borne by the Home Institute even during the candidate's stay in the Host Institute. No tuition fee will be charged by the host institution. However, the student needs to bear the

boarding and lodging charges. Scholarships are awarded based on merit, and the value and conditions of any scholarship awarded will be in accordance with the terms and conditions of the awarding institution.

- Regardless of the scholarship awarded, students on the joint PhD program will be personally responsible for the following expenses unless otherwise advised:

    - Incidental fees and charges at either institution
    - Accommodation and living expenses at either institution
    - All personal expenses and non-compulsory additional fees at the host institution
    - All debts incurred by candidates during their stay at either institution
    - Any other debts incurred by candidates during the Joint PhD Program
    - Further the grants in respect of attending conferences will be provided only by the home institute.

Fees details:

The selected candidate needs to pay the fee only to the Home institution and the details about the fee structure can be found below:

- **IIT Mandi** https://academics.iitmandi.ac.in/fees
- **IIT Jammu** https://www.iitjammu.ac.in/fee

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