भारतीय प्रौद्योगिकी संस्थान मण्डी
Indian Institute of Technology Mandi

Indian Institute of Technology Mandi

Information Brochure

M.Tech (Research) + PhD (Dual degree)
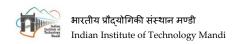## 2023-24

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IIT Mandi invites applications for the M.Tech (R) + Ph.D. Dual Degree program in engineering discipline. The institute offers M.Tech (R) + Ph.D. Dual Degree program through its different Schools/Centers. The award of this degree is in recognition of high academic achievements, independent research, and application of knowledge to the solution of technical and scientific problems in engineering.

(A) Important Guidelines for M.Tech (R) + PhD (Dual Degree) Application

1. Please read the instructions given in the brochure carefully before filling up the applications.

2. **Online** Application form & Information brochure (Including the admission schedule along with the important dates) is available on the institute website at the following link: https://www.iitmandi.ac.in/phdprograms.php

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 specialization, 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. *Mode of Payment: SBI Collect Portal.*

   b. Applicant should submit fee on SBI collect portal of the IIT Mandi and submit generated transaction number to the OAS admission application portal Link: (https://www.onlinesbi.com/sbicollect/icollecthome.htm)

   c. 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 2022-23 by the Competent Authority in the prescribed format must be uploaded in the ONLIINE application form.

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.

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

13. **The link to apply online is :** https://oas.iitmandi.ac.in/External/Admission/Login.aspx .

(B) Important Dates for admission:

Starting date for filling Online Application	18th May, 2023
Last date for filling Online Application	31st May, 2023
Declaration of shortlisted candidates list	Will be Published on IIT Mandi website
Shortlisted candidates will be informed by email	

(C) Contact details:

In case of any query related to the M.Tech (R) + Ph.D. (Dual Degree) Programme admission process you may contact respective school/Centre, the contact details are:

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 Civil & Environmental Engineering	scene_admissions@iitmandi.ac.in	----
School of Computing and Electrical Engineering	sceeoffice@iitmandi.ac.in	01905-267071
Indian Knowledge System and Mental Health Application (IKSMHA)	iksmha@iitmandi.ac.in	---
School of Mechanical and Materials Engineering	smmeadmissions@iitmandi.ac.in	01905-267138

(D) About the Institute

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.

We invite you to join our community of scholars and innovators at IIT Mandi and be a part of our journey towards excellence in education and research.

(E) Academic Structure and M.Tech (R) + PhD (Dual Degree) Programme

IIT Mandi offers a comprehensive academic structure for M.Tech (R) + PhD (Dual Degree) programs in various disciplines of engineering. Our program is designed to provide a rigorous and in-depth understanding of the chosen field of study.

The duration of our M.Tech (R) + PhD (Dual Degree) program is typically 3-5 years, during which students will be exposed to a wide range of academic activities such as coursework, research, seminars, and workshops. The academic structure of our dual degree program is as follows:

- **Coursework:** At the beginning of the program, students will be required to complete a set of coursework to develop a strong foundation in the chosen field of study. The coursework will typically involve advanced topics in the chosen field of study and will be designed to equip students with the necessary skills and knowledge to pursue research in their respective fields.
- **Comprehensive Examination:** After the completion of the coursework, students will be required to take a qualifying comprehensive examination to demonstrate their understanding of the coursework and readiness to undertake independent research.
- **Research:** The research phase of the dual degree program is the most important and the longest. Students will be required to conduct original research in their chosen field of study, under the guidance of a faculty advisor. The research phase will involve the development of a research proposal, data collection, analysis, and interpretation, and the writing and defending of a thesis.
- **Seminars and Workshops:** Throughout the program, students will be required to attend and present their research at various seminars and workshops. This will provide students with an opportunity to interact with experts in their field and to receive feedback on their research.

At IIT Mandi, we believe in providing our students with a well-rounded education that prepares them for a career in academia, industry, or government. Our programs are designed to produce graduates who are not only experts in their chosen field of study but also possess the necessary skills and competencies to succeed in their future endeavours.

(F) Schools/Centres

Faculty members belong to broadly and loosely defined Academic Schools/Centres. Each School/Centre provides a home base for faculty whose interests share some fundamental academic principles. Some faculty members also have joint appointments in other Schools. By broadly grouping faculty members into Schools/Centres, IIT Mandi has avoided traditional departments and divisions within the institute. This has been done with a view to actively foster an interdisciplinary culture and collaborative research and projects across disciplines within the institute. The details about the different postgraduate and doctoral programmes in different schools/centre can be found in the below mentioned table.

Name of School/Centre	Information Brochure
Centre Artificial Intelligence and Robotics (CAIR)	CAIR-PG-Brochure
School of Biosciences & Bioengineering	SBB-PG-Brochure
School of Civil & Environmental Engineering	SCENE-PG-Brochure
School of Computing and Electrical Engineering	SCEE-PG-Brochure
Indian Knowledge System and Mental Health Application (IKSMHA)	IKSHMA-PG-Brochure
School of Mechanical and Materials Engineering	SMME-PG-Brochure

(G) List of Research-based Programmes at IIT Mandi:

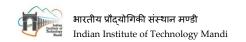| Sr. No.	Name of Programme	Discipline, School/Centre
1.	Doctor of Philosophy (Ph.D.)	Artificial Intelligence and Robotics (CAIR), Biosciences & Bioengineering, Chemical Sciences, Civil & Environmental Engineering, Computing and Electrical Engineering, Humanities & Social Sciences, Indian Knowledge System and Mental Health Application (IKSMHA), Management, Mathematical & Statistical Sciences, Mechanical and Materials Engineering, Physical Sciences
2.	M.Tech (Research)/ MS(Research)/ MA(Research)	Fluid and Thermal Engineering, Materials and Energy Engineering, Mechanical Design, Manufacturing, Computational mechanics, Product Design / Electric Vehicles / Robotics / Mechatronics / Biomechanics, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Environmental Engineering, Geomatics Engineering, Control and Automation, Computer Science and Engineering, Data Analytics, Differential Equations / Deep Learning / Control Problems / Computing, Computational Finance, Machine Learning, Biotechnology, Robotics, Cognitive Engineering & Indian Thought System

3.	M.Tech	Fluid and Thermal Engineering, Materials and Energy Engineering, Structural Engineering, Communications and Signal Processing (CSP, Very Large-Scale Integration (VLSI)), Electric Transportation, Computer Science and Engineering, Power Electronics and Drives, Biotechnology
4.	Master of Technology (Research) +Ph.D. (Dual Degree)	Artificial Intelligence and Robotics (CAIR), Biosciences & Bioengineering, Civil & Environmental Engineering, Computing and Electrical Engineering, Mechanical and Materials Engineering, Indian Knowledge System and Mental Health Application (IKSMHA).

(H) Research Facilities

IIT Mandi has state-of-the-art research facilities that provide an ideal environment for cutting-edge research across various disciplines. The institute has made significant investments in the establishment of these facilities, which are continuously upgraded to keep pace with evolving technologies. Some of the research facilities available at IIT Mandi are:

- **Advanced Materials Research Centre (AMRC)**: AMRC is equipped with advanced analytical tools and equipment for research in the field of materials science and engineering. The lab is equipped with instruments such as XRD, SEM, TEM, XPS, Raman spectrometer, etc.

- **BioX Centre**: BioX is a research centre and has state-of-the-art facilities for research in the broad areas of biosciences and bioengineering. Apart from various sophisticated equipment, the centre also has microbial and mammalian cell culture facilities, Model organism facilities (like C. elegans) and animal house.

- **Centre for Design and Fabrication of Electronic Devices (C4DFED)**: C4DFED is a research facility that focuses on the development of electronic devices and circuits. The centre is equipped with modern tools and equipment for fabrication and characterization of electronic devices along with class 100 clean room.

- **High-Performance Computing (HPC) Facility**: IIT Mandi has a dedicated HPC facility that provides researchers with access to high-performance computing resources for complex simulations and data analysis.

- **Central Library:** The Central Library IIT Mandi, is a very special place in the IIT Campus with its rich collection of books and journals in the field of Engineering Science & Technology and related areas. The library stands as a unique Knowledge Centre that offers access to essential and specialized information resources and services to meet the growing information needs of its users. IIT Mandi Library operations are automated using KOHA. The library currently houses over 43392 books (21618 print books & 21774 e-books) and provides access to more than 48746 e-resources.

- **Workshop Facilities:** The workshop facilities at IIT Mandi are well-equipped and provide practical training to students in various engineering fields. The workshop facilities include a machine shop, welding shop, carpentry shop, foundry, and electrical and electronics labs. These facilities have

various tools and machines such as lathes, milling machines, drill machines, CNC machines, welding machines, and other necessary equipment.

(I) Application Information:

The brochure contains detailed information about the branches offered for admissions, specific qualifications required, tentative modes of admission, important dates, and other relevant details. Each school/Centre appoints an admission committee who will oversee the admission process.

(J) General Qualifications for M.Tech (R) + PhD programs (Dual Degree):

Candidates will be admitted to the M.Tech. (by Research) + Ph,D,(Dual Degree) Programme in Engineering in full time regular mode.

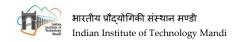### (J.1) Eligibility and Minimum Educational Qualifications:

a) Candidates with B.Tech./BE/M.Sc. with valid GATE Score.
b) In case of B.Tech./BE degree from Centrally Funded Technical Institutes (CFTIs) with CGPA>= 8 on a 10.0 point scale (or equivalent), National Level examination is waived off for HTRA fellowship.

(J.2) Course work:

The scholar would need to complete a total of 24 credits of course work and other mandatory courses (e.g. Research Methodology) of PG level. It is mandatory to complete course work within one year after admission. Minimum 7.0 CGPA is required to continue for dual degree programme. Grading will be done as same as UG programmes.

(J.3) Exit options:

a) Exit from the dual degree to single degree is not right of the student. However, DC can recommend such conversion only based on student academic performance.
b) In case of CGPA <7.0 in minimum 24 credits (After first year), student can be converted for M. Tech. (by Research) from dual degree programme.
c) No fellowship will be granted after conversion to M.Tech. (by Research) programme.
d) Dual degrees will be awarded after successful completion of the programme.
(Full details of the programme are available at https://cloud.iitmandi.ac.in/f/cbc9eb261d8b472d9b25/)

(J.4) Broad Areas:

	School/Centre	Broad Research Areas
1.	**AI and Robotics**	**Robotics:** • AI-based robotics • Multi-Agent robotics • Haptics and Teleoperation robotics • Underwater robotics • Medical/Healthcare robotics. **Artificial Intelligence:** • Healthcare • Core AI research • Systems for AI • AI for Society and Environment. **Drone Technology**
2.	**Biosciences and Bioengineering**	• Cardiac Fibrosis mediated Heart Failure • Tissue engineering • 3D Bioprinting • Regenerative Medicine • Biomaterials • Cell and Molecular Biology • Neuroscience • Aging • Stress response • Protein homeostasis • Nanomedicine • Nanosensing • Metabolic Systems Biology • Metabolomics • Fluxomics • Phytochemistry • Cellular Bioprocessing • Plant microbial metabolism • Climate Controlled Agriculture • Metabolic and Molecular Mechanisms of Nonalcoholic Fatty Liver Disease (NAFLD) • Cell Signaling in insulin secretion • Molecular and metabolic mechanisms of insulin resistance i n type 2 diabetes • Host-pathogen interaction, Immunology, • Computational and Systems Biology • Next generation sequencing applications, • Gut Microbiome and gut associated diseases • Autoimmune diseases • Microbial consortia formulation for environmental pollutant degradation.
3.	**Civil and Environmental Engineering**	• Geotechnical engineering • Water resource Engineering • Environmental Engineering • Structural Engineering • Geoinformatics Engineering

| 4. | Computing and Electrical Engineering | **Theoretical Computer Science and Computer Systems:**
● Algorithms and Data Structures
● Communication complexity and distributed computing
● Applied robotics

Intelligent Systems:
● Cognitive Science, AI
● AI/ML for Cybersecurity
● Computer Vision
● Biomedical Imaging
● Human-Computer Interaction
● 360, virtual or augmented reality
● Machine Learning
● Machine Learning for Signal processing

Power Engineering, Control and Automation:
● Mathematical control theory
● Machine learning control
● Fault diagnosis and fault-tolerant control
● Controlled Environment Agriculture
● Control for CPS/IoT
● Networked Control System
● Control and decision making over networks
● Control of Connected and Autonomous Vehicles
● Control of Multi-Agent and other Robotic Systems
● Estimation and filtering
● Target tracking
● Continuous glucose monitoring
● Electrical Machines and Drives
● Power Electronics
● Power Systems

Microelectronics and VLSI:
● Analog and Mixed-signal VLSI Design
● RF and Microwave
● FPGA-based IoT and Hardware Security
● Micro & Nanoelectronics
● Digital VLSI Architecture Design for Communication
● Biomedical Embedded Systems
● Semiconductor Physics/ Devices
● Sensor and Networks
● Digital VLSI Architecture Design for Communication, Signal Processing, and Artificial Intelligence

Signal Processing and Communications:
● Photonics
● IoT networks
● Communication networks
● Communication Theory
● Wireless Communication
● RF and Microwaves communications & component design
● Information theory
● Signal processing, image processing
● Machine learning for signal/image processing & |

		communications
		Digital Health: • Medical Imaging and Computer Vision, AI in Healthcare, Radiomics in Oncology • AI, HCI, and Cognitive Science with a focus on digital health • Medical Imaging and Computer Vision, AI in Healthcare • AI-based diagnostic and prognostic models, Computational Biomarkers • Continuous glucose monitoring, Pandemic (e.g., Covid-19) spread analysis • Computational Neuroscience, Neurovascular Coupling, Neurodiagnostic and Neurotherapeutics • IoT based EM Biosensors for 5G applications, Smart Sensor for Eye, Bone and Heart diseases • Medical Image Analysis using Deep Learning • In memory computing, Hardware security, Medical image compression • MR Image processing, MRI hardware, and Affordable MRI
5.	**Indian Knowledge System and Mental Health Applications (IKSMHA) Centre**	**Indian Knowledge System** • Integrative study of body, mind and consciousness • Scientific characterization of brain network with the intervention of Yoga and Meditation Learning • Mind-brain paradigm from Ayurveda or Bhagavata Samkhya • Indian Performing Arts and Cognition **Cognition** • Neuroscience • Cognitive Psychology • Cognitive Science • Human Factors • Cognitive Technology and Bio/Neurofeedback • Judgment and Decision Making • Virtual reality and sensors (Virtual Reality Applications) • Bio/Neuro/Physiological (Sensing) • Mental Health Applications (Depression, Stress and cognitive loading, Sleep)
6.	**Mechanical and Materials Engineering**	**Mechanical Design** • Acoustics • Solid Mechanics and Design • Computational Solid Mechanics • Continuum Mechanics • Fracture-Fatigue • Functionally Graded Materials • Mechanics of Composite Materials • High Technology Materials and Structures • Machine Design • Vibration • Smart material/Structure

- Electric Vehicles
- Piezoelectric Energy Harvesting
- Finite Element Method
- Modeling & Control
- Biomechanics
- Orthopedic Biomechanics
- Implant Design
- Bone & Biomaterial Fracture
- Deformation induced emissions
- Structural health monitoring
- Smart materials and structures
- Vibration energy harvesting

Fluid Thermal
- Alternative Fuels
- Battery Management
- IC Engines
- Emissions Control
- Experimental Fluid Dynamics
- Spray Atomization & Combustion
- Advance Laser Diagnostics & Image Processing
- Snow avalanche dynamics
- Multiphase flows
- Computational fluid dynamics
- Population balance modelling
- Non-Newtonian fluids
- Fluid Mechanics
- Thermal Science and Engineering
- Thermal Radiation
- Solar Radiation
- Collimated Beam Radiation
- Non-gray Radiation
- Interface capturing
- Mesoscale simulations
- Probes and instrumentation for two-phase flow
- Experimental Nanofluidics
- Liquid Phase Electron Microscopy

Manufacturing
- Additive Manufacturing (Metal, Polymer - Particulate, Short and Continuous fiber, Ceramics)
- Cyber Security in Additive Manufacturing
- AI and Machine learning in Manufacturing
- Design and development of Composites for specified application
- Waste utilization
- Additive manufacturing (Extrusion based Metal and Continuous Fiber Reinforced composites 3D printing
- Highly filled (metal, short fibre filament production)
- LCA
- Advanced Manufacturing
- Perovskite Solar Cells
- Solar Thermal utilization
- Energy Storage

		• Advanced Manufacturing Processes for Polymer Composites • Sustainable Biocomposites • Recycling of Polymer Composites • Surface Engineering and Experimental Tribology **<u>Materials Engineering</u>** • Glasses for Electrical Applications • Solid State Refrigeration • Pyroelectric Energy Harvesting Materials and Methods • Piezoelectric Energy Harvesting Materials and Methods • Carbon based micro/ nano devices • Microstructure and crystallinity of sp2 carbons • Waste-derived carbon • Nano-manufacturing for Electronics Sensor and Microsupercapacitor applications • Vapor Phase Growth(CVD, PVD & ALD) of Functional Nanostructures and Thin films • Phase Transition in Functional Oxide Materials and Thin Films • Nano-mechanics of Phase Change Materials and 2D Materials • Analytical Microscopy and Imaging **<u>Materials Science</u>** • Drug Delivery System, Biosensors • Micro porous membranes • Multifunctional hybrid material • Condensed Matter Physics and Materials Science

(K) Shortlisting:

Each school/centre has its own shortlisting committees. These committees set the shortlisting criterion for each stream. The shortlisting criterion is generally different for each school and each specialization. The minimum qualifications are advertised in the notification. The shortlisting committees may set higher shortlisting criterion than advertised. The shortlisted candidates' details along with shortlisting criterion will be published on the institute's website. Shortlisted candidates may receive email regarding the admission procedure details on the provided Email ID in the application form.

(L) Admission Process:

Various committees in each school/centre conduct the admission process independently. The admission process may have written test or interview or both. Based on the performance of the candidates, committees will recommend the suitable candidates for admission. Whenever there is a written test, GATE syllabus will be treated as standard syllabus, unless otherwise specified.

Selected candidates' details are published in the institute website. Selected candidates will get the admission offer letter from the academic section along with fee and other details. A waitlist is normally maintained to offer admission to the deserved candidates. Selected candidate has to pay the fee within the stipulated time and reserve the seat, since the academic sessions start as per the Institute's calendar.

Fees details: The fees will be applicable as per the fees of the regular Ph.D program. The detailed fees structure is available at (https://iitmandi.ac.in/fees).

Tentative institute fee amounts (as per approved fee structure for AY-2022-2023) payable at the time of Admission (in Rs.)			
Indian National			Foreign National
Regular Ph.D. Programme		Ph.D. Sponsored/External Registration Programme (ERP) & Part Time Programme	Ph.D. Programme
UR/OBC(NCL)/EWS	SC/ST/ PwD		
Rs. 41,250/-	Rs. 31,250/-	Rs. 81,250/-	Rs. 1,42,250/-
Boarding & lodging: Hostel Charges :14400/- *Mess Charges (to be paid to the vender through Institute as per actual, approx. rate (Rs. 22800/-)*			*Boarding & lodging:* Hostel Charges: Rs.43200/- *Mess Charges (to be paid to the vender through Institute as per actual, approx. rate (Rs. 22800/-)*

(M) Financial Assistance:

Scholars will be awarding fellowship as per funding agency criteria and norms. For e.g. for HTRA fellowship, candidate should have qualified national level examination. In case of B.Tech./BE degree from Centrally Funded Technical Institutes (CFTIs) with CGPA>= 8 on a 10.0 point scale (or equivalent), National Level examination is waived off for HTRA fellowship. Below mentioned table represents year wise HTRA fellowship:

First year	31,000/- p.m
Second year	31,000/- p.m
Third year	35,000/- p.m. (upon SRF conversion)
Fourth Year	35,000/- p.m
Fifth Year	35,000/- p.m

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