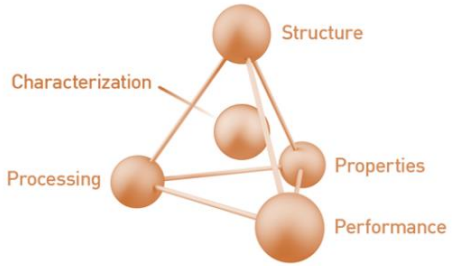
Ph.D. Admissions: July 2025



Materials Science & Metallurgical Engineering (MSME)

Visit us online: https://msme.iith.ac.in

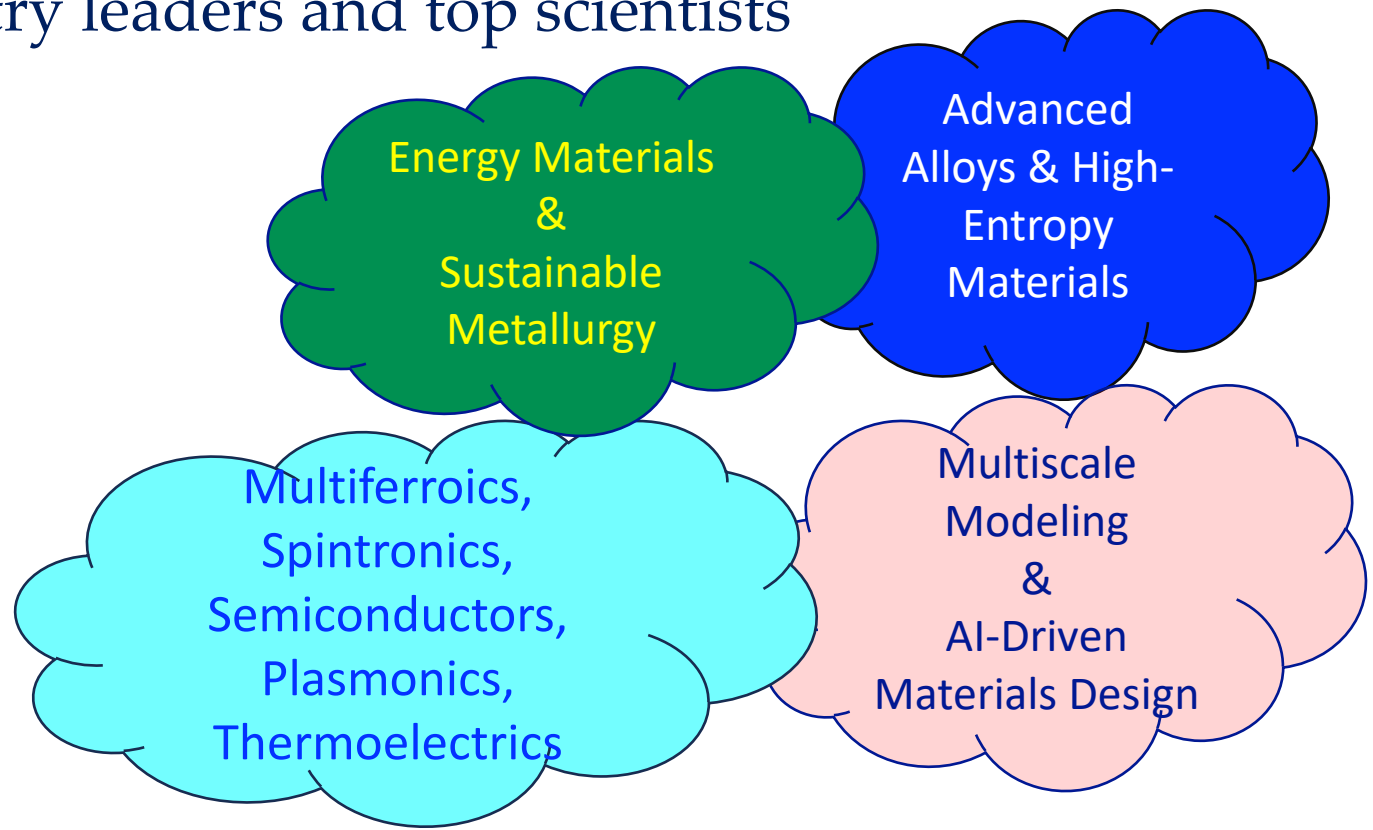
భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Why Pursue a Ph.D. with us?

- Work on cutting-edge and innovative research problems
- Access world-class labs & facilities
- Collaborate with industry leaders and top scientists

Selection Process

Stage 1. Screening
Stage 2. Written Test (MCQ)
Stage 3. **Interview**



Visit www.iith.ac.in for more information and apply online

Major Research Areas

Structural Materials: *High Entropy Alloys; Composites; Steels; Additive Manufacturing*

Functional Materials & Devices: *Semiconductors, Metamaterials, Spintronics, Plasmonics, Multiferroics, Catalysts, Microelectronics Packaging, Thin film fabrication*

Computational Materials Science & AI/ML: *DFT, Phase-field, Multiscale Modeling, Materials Informatics*

Sustainable Metallurgy: *Extractive & Process Metallurgy, Ironmaking and Steelmaking, Recycling, Electrochemical processes, Hydrogen storage and transport, Waste-heat recovery*

Advanced Characterization of Materials: *Advanced microscopy techniques - in situ, correlative, scanning probe; Atom probe tomography, Diffraction, Spectroscopy*

Energy materials: *Batteries and supercapacitors, 2D materials, Hydrogen production and fuel cells, Carbon capture, Thermoelectrics, Solar cells, Nanomaterials synthesis, Magnetic refrigeration, piezoelectric sensors*

Healthcare and Biomaterials: *Cellulose composites and microbial materials; Biomedical implants, Drug delivery; Food packaging*

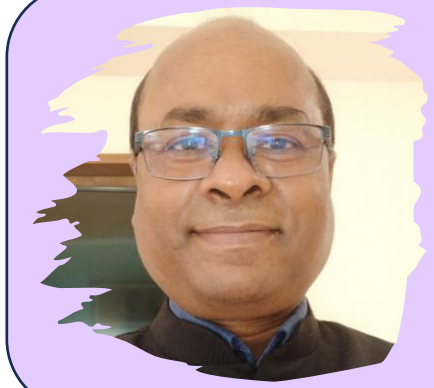
 **Meet Our Faculty**
Expert researchers in computational materials, energy materials, metallurgy, and more.

B. S. Murty

Professor

Research Interests

Thermodynamics & kinetics of phase transformations ,
High entropy alloys
Email: bsm@msme.iith.ac.in



Bharat B. Panigrahi

Professor

Research Interests

Powder Metallurgy
Advanced ceramics & composites
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Pinaki P. Bhattacharjee

Professor

Research Interests

High Entropy Alloys
Materials processing
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Suhash R. Dey

Professor

Research Interests

Electrochemical Materials Processing
High Entropy Alloys
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G. D. Janaki Ram

Professor

Research Interests

Welding,
Additive Manufacturing
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Saswata Bhattacharya

Professor

Research Interests

Phase-field modeling
AI-Driven Materials Design
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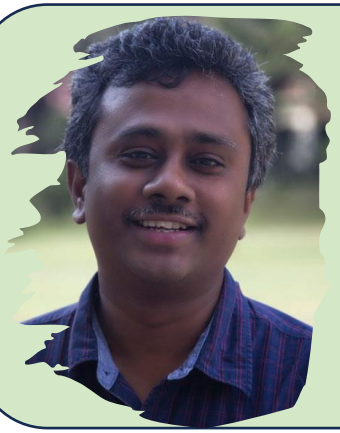

Ranjith Ramadurai

Professor

Research Interests

Multiferroic oxide thin films,
CMOS technology and memory device
Email: ranjith@msme.iith.ac.in

Subhradeep Chatterjee

Associate Professor

Research Interests

Welding, Phase Transformations and
Microstructure Development.
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Atul S. Deshpande

Associate Professor

Research Interests

Novel nanostructured materials for
catalysis, energy storage and coatings
High entropy oxides
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Rajesh Korla

Associate Professor

Research Interests

Creep and super-plasticity,
Micro mechanical deformation
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Mudrika Khandelwal

Associate Professor

Research Interests

Biomaterials and Drug Delivery
Anti-fouling/microbial materials
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Chandrasekhar Murapaka

Associate Professor

Research Interests

Spintronic-based memory/logic devices
Nanomagnetic materials
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Shourya Dutta Gupta

Associate Professor

Research Interests

Plasmonics

Nanophotonics Sensors

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Deepu J. Babu

Assistant Professor

Research Interests

Carbon capture

Nanoporous materials

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Sairam K. Malladi

Assistant Professor

Research Interests

In situ and correlative

Characterizations, Corrosion

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Suresh Kumar Garlapati

Assistant Professor

Research Interests

Printed electronics and Memristors

Oxide Semiconductors

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Mayur Vaidya

Assistant Professor

Research Interests

Diffusion-Deformation correlations

Materials processing

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Assistant Professor

Research Interests

Process metallurgy

Iron and steelmaking

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Suresh Perumal

Assistant Professor

Research Interests

Thermoelectric Materials and Devices
Magnetic Refrigeration

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Anuj Goyal

Assistant Professor

Research Interests

Multiscale modeling
Electronic structure theory

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Hemam Rachna Devi

Assistant Professor

Research Interests

Green Hydrogen Generation and Utilization, Catalysis

Email: rachnahemam@msme.iith.ac.in

Proposed Ph.D. topics

(MOE seats: *not an exhaustive list*)

Note: Several projects are running in the Department. If candidates are found suitable, they will be later notified about various open positions through funded projects.

- *In situ Transmission Electron Microscopy, In situ characterization and technique development using MEMS devices (lab on chip), Phase transformations in materials, Electrochemistry and Corrosion, Graphene based super capacitors, Materials for Energy Applications*
- *Spintronic based memory and logic devices, Nanomagnetic materials, Domain wall dynamics in ferromagnetic networks, Spin torque nano-oscillators for RF applications, Spin-orbit torque induced magnetization switching and dynamics, Magnetic tunnel junctions, Micro and Nanofabrication techniques*
- *Nanoporous materials, Adsorption, Membranes, Active separations, Defect engineering, Carbon nanomaterials, Metal-organic frameworks, Plasma functionalization, Phase inversion, Chemical vapor deposition, Nanofluidics.*
- *Process Modeling & Simulation; Extraction & Molten Metal Treatment; Continuous Casting, Inclusion Engineering & alloy steel development; Hot-slag engineering, Metal Recycling & Life Cycle Analysis of Metallurgical Processes*
- *Computational multiscale modeling of metals and alloys, First principles modeling of defects in semiconductors (oxides, nitrides, chalcogenides). Computational materials design for functional (microelectronics, quantum technologies) and structural (superalloys) applications*
- *Thermoelectric Materials and Devices, Magnetic Refrigeration, Thermoelectric Metrology, and Powder Metallurgy*
- *Synthesis and characterization of resilient and efficient catalysts, including electrocatalyst, photocatalysts and photoelectrocatalysts for hydrogen production and utilization*

Sponsored Project Ph.D. topics

Note: Several projects are running in the Department. If candidates are found suitable, they will be later notified about various open positions through funded projects.

- *Extraction of rare earth elements from secondary resources such as overburden, coal ash, rejects, tailings, etc.* (Project: CoE on clean coal technology funded by Coal India Limited, 5 years), *PI: Dr. Ashok Kamaraj*
- *Characterization & valorization of silica & lime sludge* (Funding agency: M/s. Alufluoride Ltd, Vizag, 4 years), *PI: Dr. Ashok Kamaraj*
- *Carbon capture, Utilization and Storage (CCUS) in coal sector* (Funding agency: Coal India Limited through Centre of Excellence at IIT Hyderabad: 5 years), *PI: Dr. Deepu J. Babu*
- *Fly ash-based self-cleaning Bricks/Tiles for, non-load bearing, tiles, and cladding applications* (Funding agency: Coal India, 3 years) PI: *Dr. Atul S. Deshpande*
- *Electron beam powder bed fusion of nickel-base superalloys CM247LC and BZL12Y* (Funding agency: DRDO, 5 years), *Prof. G. D. Janaki Ram*
- *THz Spintronics* (Funding agency: MoE STARS, 3 years) *PI: Dr. Chandrasekhar Murapaka*
- *Thermokinetic analysis brazing joints* (Funding agency: ARDB, 3 years) *PI: Dr. Mayur Vaidya*

Eligibility & Qualifications

Regular PhD :

- Candidates with Masters (ME/ MTech/MSc)
- BE / BTech or equivalent in any discipline with a valid GATE/ CEED Score
- MSc or equivalent in any Science discipline with a valid GATE score
- Qualified one of the national exams: INSPIRE, Joint CSIR-UGC NET with JRF, DBT JRF
- Students graduated (B.Tech.) from CFTIs with CGPA 8.0 or more, are eligible for applying (with regular Ministry of Education fellowship).
- External PhD: Working professional from Industry, Research Laboratory and others
- External Direct PhD: At least 2 years of relevant experience with NOC can be eligible for admission as External

Direct PhD:

- Direct PhD: High CGPA & High fellowship
- PhD Applications are invited from the meritorious students who have got a CGPA of 9.0 and above in their BTech/BE/BS/MSc from IITs, NITs, IISc, IISERs & CFTIs for admission to Direct PhD (High CGPA) program at IITH with high-value Institute Fellowships. (Higher stipend than Ministry of Education funding) (please refer to the flyer on IITH website)

Please note: The department reserves the right to set a different criterion which can be equal to or above the eligible criteria for shortlisting the candidates for the selection process.

Some existing Infrastructure details

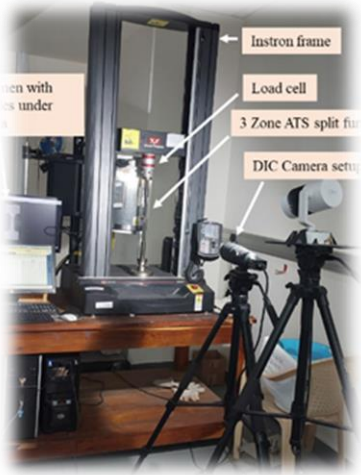
Cluster Param Seva

FEG-TEM

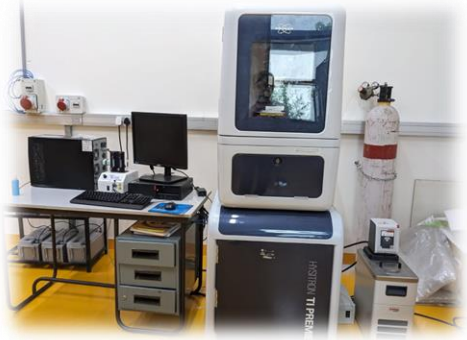
JEOL JSM-7800F

FIB-SEM

Powder XRD



High temperature UTM with DIC



High temperature nano indentor

Existing Infrastructure developed within the department:

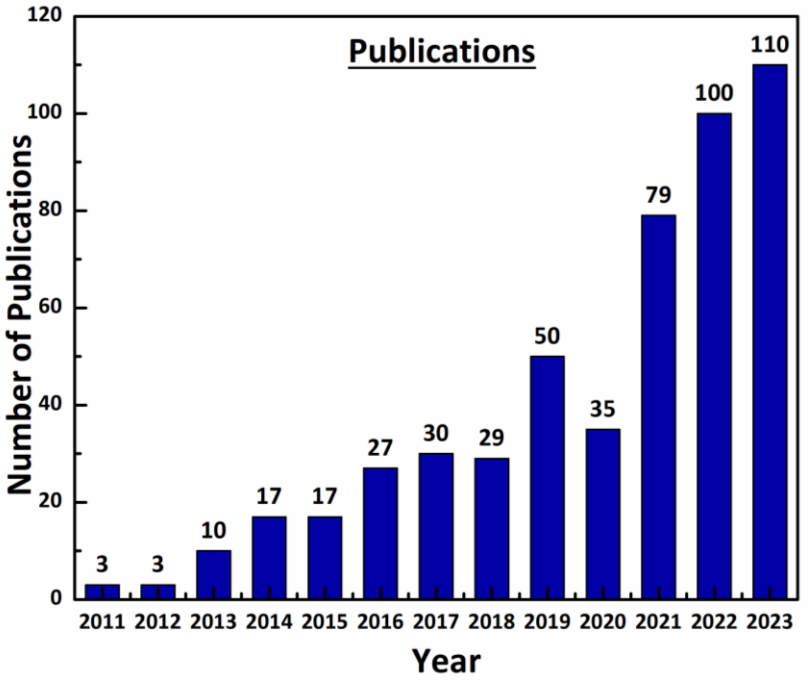
Keyhole TIG welding with a robotic arm

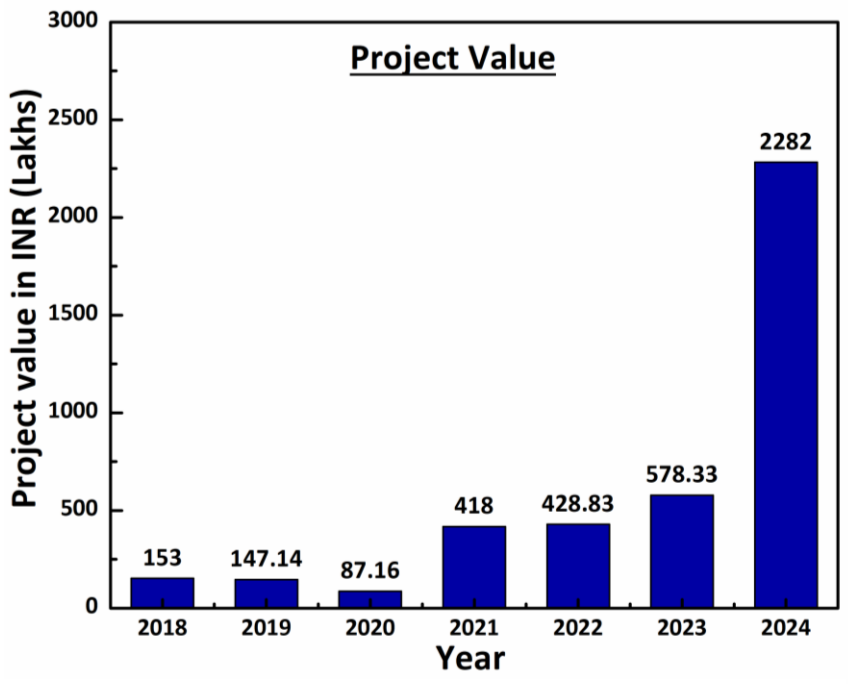
Vacuum hot press

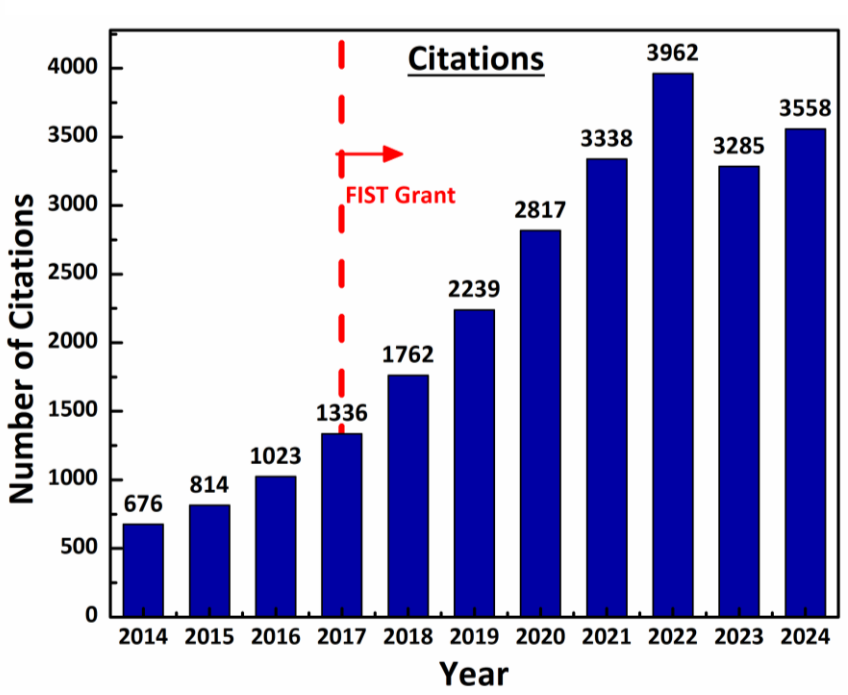
Rolling mill

100 KN servo UTM

Creep testing







The faculty of the MSME Department published their research articles in reputed international journals such as *Acta Materialia, Scripta Materialia, Scientific Report, Materials Research letters, Intermetallics, Nature Communications, Small, ACS Applied Materials and Interfaces etc*.

Some of the distinctions earned like National and International Awards, Professional Societies:

- *Science and Technology Award (STAR) award from SERB -DST, Government of India in 2021*
- *Japan Society for the Promotion of Science (JSPS) invitation fellowship (FY2021-22).*
- *ASM-IIM Visiting Lectureship Award*
- *DAAD Research Ambassador*
- *INSA Young Scientist Awards – 2022*
- *Promising Young Powder Metallurgy Professional Award, PMAI*
- *Distinguished referee award by the European Physical Journal of Applied Physics (EPJAP)*
- *Ramanujan Fellowship, DST*
- *Visiting Assistant Professor at Cornell University*
- *Fellow of INAE*

Collaborations with Indian R&D Labs, Industries, Educational Institutes

Collaborations with Overseas Institutes