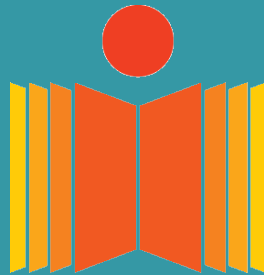


M. Tech.
in
Materials Science & Metallurgical Engineering

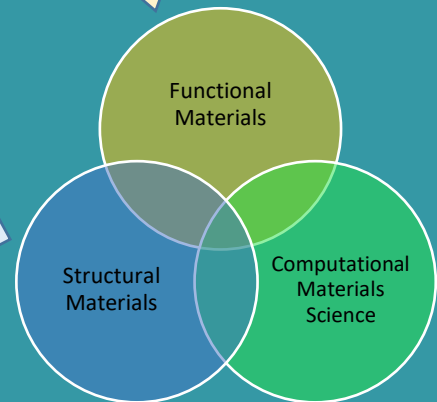


Indian Institute of Technology Hyderabad

Research Areas

- ❖ Sensors
- ❖ Magnetic Materials, Spintronics, Magnetic Skyrmions
- ❖ Plasmonics, Nanophotonics, Micro-fluidics
- ❖ Nano synthesis, Self-assembly,
- ❖ Catalysis
- ❖ Electro-chemical deposition of functional materials
- ❖ Nature Inspired Materials
- ❖ Healthcare Materials, Drug Delivery, Tissue-scaffolds, Porous Implants and Biomaterials
- ❖ Energy Storage Materials, 2D Carbon Materials, MXene
- ❖ Piezoelectric hybrid nano composites,
- ❖ Graphene based Supercapacitors, Solar Photovoltaics

- ❖ Grain Boundary Engineering
- ❖ Mechanical Behaviour, Plastic Deformation
- ❖ Phase Transformation, solidification
- ❖ Metals and Alloys: High Entropy Alloys, Multi-Phase Alloys, Titanium Alloys, Superalloys, Steels, Dispersion Strengthened Alloys
- ❖ Bulk-Metallic Glasses, In-situ Composites
- ❖ Metallurgical Thermodynamics and kinetics
- ❖ Severe Plastic Deformation
- ❖ Thermomechanical Processing, Texture
- ❖ Nanocrystalline materials, Ultra-fine microstructures
- ❖ Creep and high temperature deformation
- ❖ Powder Metallurgy, Advanced Composites, MMC
- ❖ Multicomponent Oxides, Nanoparticles, Ceramics
- ❖ Coating, Surface Science, Wear and Tribology
- ❖ Advanced microscopy
- ❖ Metal Joining, Friction Stir Welding, Additive Manufacturing
- ❖ Diffusion in pure metals and multicomponent alloys
- ❖ Mechanics of nanoporous materials
- ❖ Corrosion in bulk and nanocrystalline alloys
- ❖ Low Temperature solders



- ❖ Phase-field Modelling, Combinatorial materials science
- ❖ Modelling Deformation Behavior Using Discrete Dislocation Dynamics,
- ❖ Continuum Crystal Plasticity
- ❖ Multi-scale Modelling of Functional Materials

Department of Materials science and Metallurgical Engineering offering two M. Tech programs:

1. M. Tech. in Materials Science and Metallurgical Engineering with MHRD fellowship.

Eligibility & admission procedure: Candidates having B. E. /B. Tech. or equivalent in Metallurgy/ Ceramics/ Mechanical / Production / Industrial / Plastics / Polymer/ or related discipline. (or) M.Sc. in Materials Science/Physics/Chemistry Valid GATE score required in MT/ME/PI/PH/CY/XE. Admission based on the GATE score of the candidates.

Candidates having B.Tech from any one of the IITs with a major in Metallurgy/ Ceramics/ Mechanical / Production / Industrial / Plastics / Polymer and secured a minimum CGPA of 8.0, GATE score is not essential.

For more information, please contact: **Dr. Rajesh Korla**

Email: rajeshk@msme.iith.ac.in

Phone: +91 9676468326

2. M. Tech. in Materials Science and Metallurgical Engineering for a) Self-Sponsored and b) Sponsored from Government laboratories/ Public sector:

Eligibility & admission procedure:

a) **Self-Sponsored:** Candidates having B.E./B.Tech or equivalent in Metallurgy/ Ceramics/ Mechanical/ Production / Industrial / Plastics / Polymer or related discipline with minimum CGPA of 7.0 or its equivalent. (or) M.Sc. or equivalent degree in Materials Science/Physics/Chemistry or related discipline with minimum CGPA of 7.0 or its equivalent. Candidates applied for self-sponsored program, GATE score is not mandatory. Admission will be based on written test and interview.

b) **Govt. Lab/ public sector sponsored:** Candidates working in Government labs or public sector institutes (including armed forces officials) with more than 2-year experience and having B. E. /B. Tech. or equivalent in Metallurgy/ Ceramics/ Mechanical / Production / Industrial / Plastics / Polymer/ or related discipline, having minimum

CGPA of 7.0 or its equivalent, (OR) M.Sc. or equivalent degree in Materials Science/Physics/Chemistry or related discipline with minimum CGPA of 7.0 or its equivalent.. Admissions will be based on written test and interview.

For more information, please contact: **Dr. Mayur Vaidya**

Email: vaidyam@msme.iith.ac.in Phone: +91 7879916780

Course structure

Semester 1	Core compulsory:		
	Properties of Materials		3.0
	Materials Synthesis and Characterization		3.0
	Advanced Physical metallurgy		3.0
	Materials Synthesis and Characterization Lab		2.0
	Core elective:		
	Any course from the basket of electives		3.0
Semester 2	Core compulsory:		
	Materials Lab.-II		2.0
	Core elective:		
	Any course from the basket of electives		9.0
	Common courses:		
	English for communication		1.0
	Industry lectures		1.0
Semester 3		Stage -I evaluation	12.0
Semester 4	Thesis	Stage - II evaluation	12.0

Glimpses of advanced level elective courses:

- Properties of Materials
- Electron Microscopy
- Thermomechanical Processing Of Materials
- Advanced Physical Metallurgy
- Advanced Materials
- Thin Films Technology
- Advanced Materials Synthesis And Characterization
- Composite Materials
- Scientific Writing And Ethics In Research
- Materials For Green Energy
- Powder Metallurgy Manufacturing
- Introduction To Computational Methods In Materials Science
- Biomaterials- Materials In Medicine
- Polymer Science And Engineering
- Thermodynamics And Kinetics Of Materials
- Electrochemistry in Materials Science and Engineering
- Soft Materials
- Phase Transformations
- Hierarchical Nanostructured Materials
- Nature Inspired Materials Engineering
- 2D Materials: Synthesis, Characterization and Applications
- Wear & Tribology

Department research facilities:

Materials Synthesis/Processing

- Pulse Laser Deposition
- E-beam deposition
- Planetary Ball mill
- Rolling mill
- Robotic welding
- Uniaxial Compaction Press
- Cold-Isostatic Press
- Induction-melting furnace
- Arc-melting furnace
- Hot press
- High Temperature Vacuum F/C
- Infra-red heating furnace
- Muffle furnace
- Tube furnace
- Salt-bath furnace
- Autoclave Ovens
- Incubator shaker
- Freeze drier
- Bio-safety cabinet
- Glove-box
- Glass vacuum sealing
- Spin and Dip coater

Materials Characterization

- Cold FEG-TEM
- FEG- SEM with EBSD
- Dual beam FIB with EBSD
- Optical Microscopes
- Ion-milling, PIPS
- Thermal analysis
- DTA, DSC, TGA, Dilatometer
- Surface area and porosity analyser
- Powder & thin film XRD
- UV visible spectrophotometer
- Raman spectrometer
- AFM
- Universal testing machine (MTS, Instron)
- Creep Testing
- Hardness Tester
- Wear (Pin-on-disk)
- Nanoindenter
- Electrochemical analyzer
- Viscometer

Softwares

Thermocalc, DICTRA, TC-Prisma, Digital Image Correlation.

Department faculty profiles



Prof B. S. Murthy

Research Interests:

Nanocrystalline materials,
High entropy alloys,
Bulk metallic glasses,
Thermodynamics and kinetics of phase transformations,
Transmission electron microscopy and atom probe tomography

Contact: bsm@msme.iith.ac.in, +91 (40) 2301 6033.



Prof. Pinaki P. Bhattacharjee

Research Interests:

Bulk ultrafine & nanostructured materials produced by severe plastic deformation processes
Structure-property relationship in SPD materials
Crystallographic texture, Electron microscopy
Recrystallization behavior of metallic materials
Mechanical behavior of materials
Development of Light metals alloys for novel applications

Contact: pinakib@msme.iith.ac.in, +91 (40) 2301 6069.



Prof. G.D. Janakiram

Research Interests:

Welding
Additive manufacturing

Contact: jram@msme.iith.ac.in, +91 (40) 2301 6565.



Dr. Bharat B. Panigrahi

Research Interests:

Powder Metallurgy & Sintering Mechanisms, Metal Additive Manufacturing, Nanostructures, High Entropy Alloys, MAX Phases and MXene, Advanced ceramics & composites, High temperature materials, Biomaterials, Microstructure-Mechanical Properties of Steels, Surface modification by Electro-Spark Deposition, Wear & Tribology

Contact: bharat@msme.iith.ac.in, +91 (40) 2301 6032.



Dr. Suhash R. Dey

Research Interests:

Advanced Multi-Functional Nanostructured Materials/High Entropy Alloys
Combinatorial Alloy Design of emerging materials (Co-Cu-Fe-Ni-Zn High Entropy Alloys, CIGS & CZTSSe solar photovoltaics, Additive Manufactured Binary & Ternary Ti-based Biomaterials, IFHS Steel) through combined computational (DFT) and experimental techniques (electrodeposition, powder metallurgy, ink jet print)

Contact: suhash@msme.iith.ac.in, +91 (40) 2301 6096.



Dr. Atul S. Deshpande

Research Interests:

Nanoparticle synthesis and self-assembly, sol-gel processes, templating techniques
Novel nanostructured materials for advanced applications including catalysis
Solid oxide fuel cells (SOFC), ferroelectric materials
Bone replacement materials and drug delivery systems

Contact: atuldeshpande@msme.iith.ac.in, +91 (40) 2301 7044.



Dr. Ranjith Ramadurai

Research Interests:

Multiferroic oxide thin films for fundamental science and functional device applications
High-k dielectric thin films for CMOS technology and memory device applications
Surfaces and Interfaces of oxide hetero structures on silicon and single crystalline oxide substrates
Influence of process conditions, strain engineering and interface engineering on domains and domain dynamics of multiferroic thin films utilizing scanning probe microscope

Contact: ranjith@msme.iith.ac.in, +91 (40) 2301 7046.



Dr. Saswata Bhattacharya

Research Interests:

Phase transformations in alloys and oxides
Phase-field modelling of microstructural evolution
Modelling deformation of materials using discrete dislocation dynamics and continuum crystal plasticity
Microstructure-property correlations

Contact: saswata@msme.iith.ac.in, +91 (40) 2301 7107.



Dr. Mudrika Khandelwal

Research Interests:

Bacterial cellulose and other natural materials- understanding structure, mechanism and applications
High performance green composites, liquid crystals and self-assembly of rod-like entities
Drug Delivery, strategies for developing anti-fouling and anti-microbial materials
Materials for tissue scaffolding.

Contact: mudrika@msme.iith.ac.in, +91 (40) 2301 7118.



Dr. Subhradeep Chatterjee

Research Interests:

Phase Transformations and Microstructure Development
Laser and Electron Beam Processing
Welding and Surface Treatment
Modelling and Simulation,(Phase Field/FEM/CVM)

Contact: subhradeep@msme.iith.ac.in, +91 (40) 2301 8442.



Dr. Sairam K. Malladi

Research Interests:

In situ characterization and technique development using MEMS devices (lab on chip)
Phase transformations in materials, Electrochemistry and Corrosion
In situ Transmission Electron Microscopy
Graphene based super capacitors, Materials for Energy Applications

Contact: srkm@msme.iith.ac.in, +91 (40) 2301 7003.



Dr. Rajesh Korla

Research Interests:

Deformation at room temperature
Creep and super-plasticity
Micro mechanical deformation
Molecular dynamic simulations
Nano indentation

Contact: rajeshk@msme.iith.ac.in, +91 (40) 2301 6559.



Dr. Shourya Dutta Gupta

Research Interests:

Nanophotonics, Plasmonic nanostructures and nanoparticles
Metamaterials and metasurfaces, Sensors, Alternative materials for plasmonics
Alternative fabrication techniques, Nano-optical biosensors
Graphene based devices, Lab-on-a-chip based optical devices,
Microfluidic devices

Contact: shourya@msme.iith.ac.in, +91 (40) 2301 6561.



Dr. Chandrasekhar Murapaka

Research Interests:

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

Contact: mchandrasekhar@msme.iith.ac.in, +91 (40) 2301 6562.



Dr. Mayur Vaidya

Research Interests:

Diffusion-Deformation correlations in materials
Phase growth and interdiffusion kinetics in thermoelectric materials
Diffusion in multicomponent alloys
Processing, characterization and stability of nanocrystalline alloys

Contact: vaidyam@msme.iith.ac.in, +91 (40) 2301 6564.