

Department of Materials Science and Metallurgical Engineering

M.Tech. Admission Brochure
July 2014

Atoms to Applications



INDIAN INSTITUTE
OF TECHNOLOGY
HYDERABAD

भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

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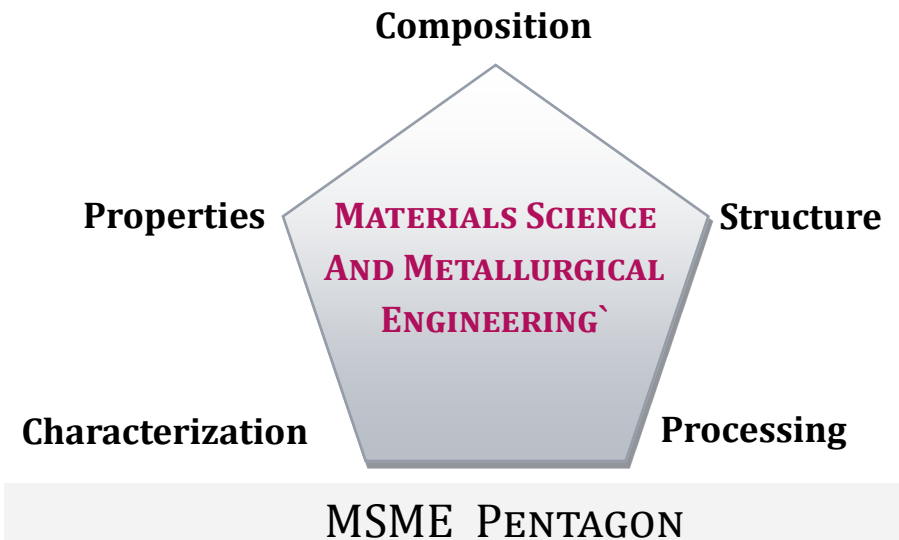
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About the Department

The department of Materials Science and Metallurgical Engineering is one of fourteen departments at IIT Hyderabad. The vision of the department is to be a globally recognised centre of excellence in materials research translating fundamental understanding of materials into development of innovative, sustainable and environmental friendly technologies and products for social benefits and needs. The research philosophy of the department is imbibed in “*Atoms to Applications*”, thus encompassing all aspects of material science and metallurgical engineering from developing fundamental concepts to translating the concepts into material design and manufacturing for actual engineering applications. The department aims to inculcate in its students the understanding of the interplay between fundamental aspects of materials science and metallurgical engineering - composition, structure, processing, characterization and properties (“*the MSME Pentagon*”) and enables them to develop and innovate technologies.

The MSME department at IITH offers unique innovative courses, which are unparalleled with courses at other IITs. Research programs (M.Tech. and Ph.D) are closely designed with national research laboratories and industries. Course work offered in the department covers broad fields of materials science and metallurgical engineering from fundamentals to advanced and emerging areas, some of which are thermo-mechanical processing, thin films and devices, nano-materials, biomaterials, energy materials, and electron microscopy. The meticulously designed research programs and taught courses impart strong foundation and enhance the state of the knowledge of students to make them “future-ready” professionals. IITH is also unique in introduction of fractal courses that facilitates expansion of the core subject acumen as well as personal skills for all round development.



The ongoing departmental collaborations are with the following:

Universities

- Technical University Dresden, Germany
- University of Metz, France
- Kyoto University, Japan
- Ritsumeikan University, Japan
- POSTECH, South Korea
- Gyeongsang National University, Jinju, South Korea
- Donetsk Institute for Physics and Engineering, Ukraine

Research laboratories

- ARCI Hyderabad
- DMRL Hyderabad

Research Areas Offered



Dr. Pinaki Prasad Bhattacharjee, Assistant Professor & Head of the Department

Areas of interest : Bulk ultrafine and nanostructured materials produced by severe plastic deformation processes and structure-property relationship in such materials, Crystallographic texture, Electron microscopy, Recrystallization behavior of metallic materials, Mechanical behaviour of materials, Development of Light metals (e.g. Al, Mg, Ti) alloys for novel applications, High entropy alloys

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



Dr. Suhash Ranjan Dey, Assistant Professor

Areas of interest : Emerging alloys (Biomaterials, Solar Photovoltaics, Thermoelectric Materials) design through combinatorial approach; Materials processing (Friction Stir Welding/Processing, Accumulative Roll Bonding) and testing; Improvement of properties of various Titanium alloys through thermomechanical processing and phase transformation-microstructure characterization studies.

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



Dr. Ranjith Ramadurai, Assistant Professor

Areas of interest : Multiferroic oxide thin films for fundamental science and functional 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@iith.ac.in, +91 (40) 2301 7046, +91-9494424990



Dr. Bharat Bhooshan Panigrahi, Assistant Professor

Areas of interest : Powder Metallurgy Manufacturing, Sintering Mechanisms, Nanocrystalline materials, MAX Phases and Advanced Ceramics, Ceramic Reinforced Composites, Light Metals & Intermetallics, Steels and Grain Boundary Engineering, Porous Implants and Biomaterials, Wear and Tribology.

Contact: bharat@iith.ac.in, +91(40) 2301 7072



Dr. Atul Suresh Deshpande, Assistant Professor

Areas of interest : 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@iith.ac.in, +91 (40) 2301 7044

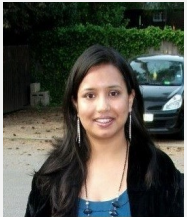
Research Areas Offered.....



Dr. Saswata Bhattacharya, Assistant Professor

Area of interest: Phase transformations in alloys and oxides, phase-field modelling of microstructural evolution, microstructure -property correlations, modelling deformation behaviour using discrete dislocation dynamics, continuum crystal plasticity, multiscale modelling of functional materials

Contact: saswata@iith.ac.in, +91 (40) 2301 7113



Dr. Mudrika Khandelwal, Assistant Professor

Area of interest: Bacterial cellulose and other natural materials- understanding structure, mechanism & applications, high performance green composites, liquid crystals and self-assembly of rod-like entities, fibre spinning, strategies for developing anti-fouling and anti-microbial materials, materials for tissue scaffolding, flexible electronic materials

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

Centers & Labs

The department has state-of-art laboratories well equipped with high-end equipment. Some of the laboratories available for graduate & research scholars are:

- Advanced Structural Lab
- X-Material Innovation Hub
- Functional Materials Lab
- High Temperature Materials Lab



Facilities

Characterisation

- Hot Stage Automated upright Microscope (Leica DM 6000M and Linkam Hot stage)
- Powder X-ray Diffractometer (PANalytical Xpert Pro)
- Atomic Force Microscope (Nanoscope -V, Veeco)
- Laser Micro-Raman spectrometer (SENTERRA Bruker)
- FTIR (TENSOR 37 Bruker)
- UV-VIS-NIR spectrometer (Shimadzu UV-3600)
- TGA/DTA instruments (Linseis and TA Instruments)
- DSC instruments (Netzsch and TA Instruments)
- FEG-SEM with EBSD & EDS (Carl Zeiss)
- BET

Synthesis equipment

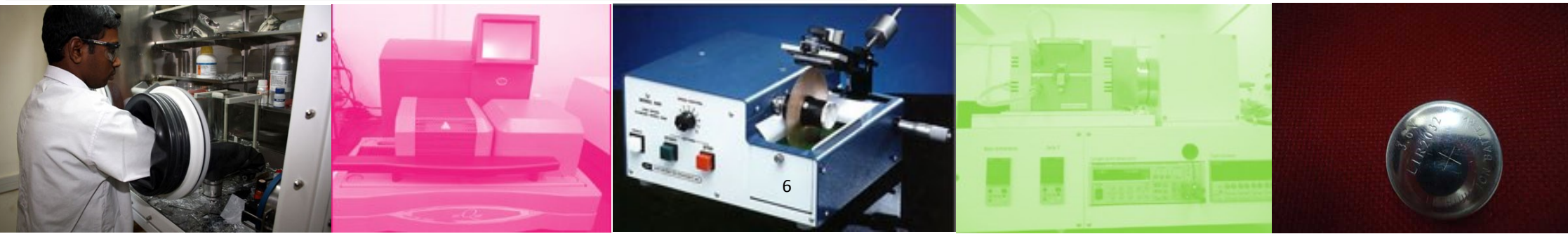
- PLD (Pulse LASER Deposition)
- High Energy Ball Mills (Fritsch Pulverisette-5 and Pulverisette-7)
- Powder mixer
- Uniaxial Compaction Presses (automatic and manual compaction)
- Cold Isostatic Press
- Furnaces: Salt Bath Furnace, Muffel Furnace, High Temperature (Tungsten) Vacuum Furnace, Induction Melting Furnace, IR Heating Furnace, Tubular Furnaces, etc.
- Glove Box (mBraun, LAB star)
- Centrifuge
- Oven

Properties measurement

- Microhardness (EMCO TEST DURA SCAN)
- UTM(Fatigue) (100kN MTS LANDMARK and 30kN Instron)
- Electrochemical Quartz Crystal Microbalance (HCH Instrument)
- Thermopower & Resistivity measurement system (ZEM -3 ULVAC-RIKO)
- Battery testing unit (ARBIN Instruments)
- Physical Properties Measurement System PPMS (Quantum Design- Dynacool)
- Precision Impedance analyzer (Agilent 4294A)
- Pin-on-Disc: Wear and Tribology (Ducom)
- Vertical Dilatometer (Theta)

Processing equipment

- Cutting Machines: Electric discharge machining (DEM) and Struers Discotom -16, Struers Secotom-15, Struers minitom)
- Automatic hot mounting press (Struers CitoPress -10)
- Polishing Machines (Struers LaboPol-5, ATM Saphir 330)
- Automatic polishing machine (Struers Tegramin-25)
- Low Speed Diamond Wheel Saw
- Low temperature bath (CINTEX)
- Electro polishing & etching machine (Struers LectorPol-5)
- Laboratory scale rolling equipment



Programmes

Presently the department offers only postgraduate programmes (M. Tech. & Ph.D). It has 14 M.Tech. students & over 30 PhD scholars. Around 10 students are admitted to the M.Tech. course in August each year. Masters of Technology in department of materials science and metallurgical engineering is a 2 year long programme.

Eligibility Criteria for Admission to M.Tech.

1. Candidate having B.Tech/B.E in Chemical, Mechanical, Metallurgy, Materials Science & Engg., Production and Industrial Engg, Instrumentation engineering or M.Sc. in Chemistry, Physics , Materials science or equivalent.
2. Candidate must have a valid GATE score in the following GATE papers: XE, ME, MT, PH, CH, CY and PI
3. Admission is on the basis of the GATE score

Academics

Some of the courses offered by the department:

- ◆ Advanced Physical Metallurgy
- ◆ Thermochemical Processing of Materials
- ◆ Electron Microscopy
- ◆ Properties of Material
- ◆ Thin Film Technology
- ◆ Material Synthesis & Characterisation
- ◆ Powder Metallurgy Manufacturing
- ◆ Composite Materials
- ◆ Biomaterials
- ◆ Polymer Science and Technology
- ◆ Computational Materials Science
- ◆ Crystallographic Texture
- ◆ Materials for Green Energy

