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Department of Metallurgical and Materials Engineering is one of the oldest departments of IIT Madras, established in 1959. In the first few decades of its existence, the focus was more on industrial metallurgy. However, over the past few decades, the department has adapted to the transformations and expectations worldwide in diverse areas of materials science and engineering.

The department has 33 dynamic faculty members, with their teaching, research, and consultancy activities in various areas ranging from conventional metallurgy to frontiers of materials science. Several faculty members of the department in recent times have taken the lead in establishing prospective Centres of Excellence in the areas of advanced/correlative microscopy, materials, and manufacturing for futuristic mobility that includes additive manufacturing, ceramic technologies, and surface engineering along with pyrometallurgy. The department hosts state-of-the-art materials processing and characterization facilities, along with excellent computational infrastructure. If you are interested in pursuing a career in metallurgy, materials science, and engineering, this is the department that you should be in.



Prof. Subramanya Sarma V. Head of the Department



## DEPARTMENT OF METALLURGICAL & MATERIALS ENGINEERING

# Programmes (M.Tech.)

Metallurgical and Materials Engineering

## **Research areas**

### Metal Forming and Mechanical Behaviour

- High temperature deformation
- Creep and fatigue behaviour of materials
- Hot working and deformation processing maps
- · Plastic anisotropy and crystallographic texture in materials
- Sheet metal forming

#### Materials Joining & Additive Manufacturing

- · Physical and mathematical simulations of welding
- Microstructural modelling
- Thermal field and distortion analysis
- Alloyed design for additive manufacturing
- Additive manufacturing process development

#### **Materials Processing**

- Development of advanced nano structural materials
- Directional solidification
- Development of metal foams
- Thin films and nanoparticles

#### Iron and Steel Technology

- Modelling of diffusion controlled transformations
- Development of ultra-high strength multiphase steels
- Alternate steel making technologies
- Process modelling of steel making

### **Ceramics, Functional & Biomedical Materials**

- Multicomponent high entropy ceramics
- Fibre reinforced plastics
- Solid oxide and proton exchange membrane fuel cells
- Smart materials
- Thermoelectric materials
- Magneto-electric nanocomposites
- Electrospun and electrosprayed bioceramics and biocomposites
- Energy storage materials







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- Polymer and soft materials
- Colloids and emulsions

#### **Advanced Characterisation Techniques**

- Aberration corrected transmission electron microscopy
- Electron energy loss spectroscopy
- Electron channelling contrast imaging
- Atom probe tomography
- X-ray tomography

#### **Corrosion and Surface Engineering**

- Smart and nano coatings for corrosion and erosion
  protection
- Electrochemical and corrosion behaviour
- Wear behaviour of coatings
- Development of high entropy alloy (HEA) coatings

#### **Electronic Materials**

- Printed electronics
- Low dimensional semiconductors
- Optoelectronic devices

#### **Process Metallurgy and Sustainability**

- Gas atomisation of metal powder
- · Recovery of critical metals from electronic waste
- Circular economy

#### Integrated Computational Materials Engineering

- Combined process and alloy design using ICME
- Finite element method and fast fourier transform approach to crystal plasticity CPFEM & CPFFT
- Applications of Density Functional Theory (DFT)
- Gibbs energy modelling employing CALPHAD

#### Material Informatics

- Machine learning and artificial intelligence
- Materials property prediction

## **Placements**

ISRO (Department of Space, Gol) MIDHANI (Ministry of Defence, Gol) Tata steel Aditya Birla Group Applied Materials Inc Micron GKN Aerospace Sundaram Clayton Ltd.

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## DEPARTMENT OF METALLURGICAL & MATERIALS ENGINEERING

## Faculty

- Dr Ajay Kumar Shukla
- Dr Anand Krishna Kanjarla
- Dr Balasubramanian M
- Dr Bhattacharya S S
- Dr Bhattacharyya Somnath
- Dr Bhuvanesh Srinivasan
- Dr Chakkingal Uday
- Dr Ganesh Sundara Raman S
- Dr Hari Kumar K C
- Dr Haridoss Prathap
- Dr Hemaprabha E
- Dr Kamaraj M
- Dr Lakshman Neelakantan
- Dr Manas Mukherjee
- Dr Murty B S
- Dr Murugaiyan Amirthalingam
- Dr Parasuraman Swaminathan
- Dr Phanikumar Gandham
- Dr Pradeep K G
- Dr Ranjit Bauri
- Dr Ravi Kumar N V
- Dr Ravi Sankar Kottada
- Dr Rohit Batra
- Dr Sabita Sarkar
- Dr Sampath Kumar T S (Emeritus)
- Dr Sampath V
- Dr Sankaran S
- Dr Satyesh Kumar Yadav
- Dr Sreeram K Kalpathy
- Dr Srinivasa Rao Bakshi
- Dr Subramanya Sarma V
- Dr Surendra B Anantharaman
- Dr Tiju Thomas

Visit the department website: https://mme.iitm.ac.in/



