Dear Recruiters,

With this open letter, I am enthusiastically recommending all our students – B.Tech, M. Tech, BT-MT (dual degree) and Ph.D for a job opportunity in your organization. The reason for this confidence in my students comes from the fact that at the entry point itself, these students are already top few percent of the national pool. When you combine that with the curriculum of Materials Science and Engineering (MSE) Department at IIT Kanpur and training in our various teaching and research labs, it means that our students are going to perform well in whatever career they choose to pursue. This is substantiated with achievements of our alumni in all sectors.

Our UG students do large number of courses to build their science and engineering base, some compulsory courses in MSE as major, and large number of electives in MSE and other Departments. This flexibility in the curriculum allows students to develop their interests. The professional MSE courses prepare students for jobs in many industries – automotive, aerospace, materials processing, iron and steel, non-ferrous, ceramics, health care, semiconductors, etc.

Our PG students are trained in solving problems related to materials and their processing using scientific methodologies. They are trained in state-of-the-art processing and characterization techniques, some of them are mentioned in this brochure. I am sure that they will be an asset to any industry or research organization.

Finally, the vibrant IIT Kanpur campus environment is conducive for development of personality and many soft skills in our students. Wishing you and our students a very successful recruitment session.

Monica Katiyar
Prof, and Head
MSE, IIT Kanpur
The Department of Materials Science and Engineering at IIT Kanpur strives to prepare technologists/engineers for developing new materials and processes for applications in variety of industries in metal and mining, automotive, chemical, aviation, plastic, biotechnology, semiconductor solar and energy sector.

The Department earlier known as Metallurgical and Materials Engineering was established in 1960. From its inception, it has had strong impact in providing knowledgeable manpower to meet the nation’s demand in traditional metallurgy. The department has reinvented constantly to keep the IIT curriculum in pace with the state-of-the-art technologies.

The field of study in the department now encompasses the entire spectrum of extractive metallurgy, physical metallurgy, manufacturing processing, electronic and semiconductor materials, biomaterials, ceramics and composites. This department has pioneered a unified approach to teaching and research, which has enabled us to evolve into an interdisciplinary field catering to diverse application.
Course work

2019-20 batch

B-Tech
Strength 70
4 years

BT/MT
Dual
Strength 8
5 years

M-Tech
Strength 23
2 years

PhD
Strength 85
5 years

UG Coursework
• Basic Sciences*
• Core Laboratories*
• Departmental Courses*
• Internship (2nd / 3rd year)*
• B.Tech Thesis
• Teaching Assistantship
• Internship

PG Coursework
• Transport Phenomena*
• Thermodynamics*
• Structure and Characterization of Materials*
• Mathematical and Computational Methods*
• M.Tech/Ph.D Thesis*
• Teaching Assistantship*
• Internship

Metallurgical Engineering
Iron and Steel Making
Principles of metal extraction and refining
Phase Transformations
Thermodynamics & Phase Equilibria
Mechanical Behaviour of Materials
Materials Failure: Analysis and Prevention
Structure and Characterization of Materials
Diffusion in Solids

Bio and Nanomaterials
Introduction to Biomaterials
Materials Science Technologies for Applications in Life Sciences
TEM and Nano Analysis of Materials
Nanostructures and Nanomaterials: Characterization and Properties

Electronics Materials
Electronic Devices and Characterization
Electro-ceramic Materials and Applications
Computer Simulations in Materials Science and Technology of Thin Films and Device Fabrication
Energy Materials and Technologies
Materials for Semiconductor Industry
Display Technology

Materials in Manufacturing
Materials Processing
Selection & Design of Engineering Materials
Manufacturing processes
Solidification Processing
Heat Treatment and Surface Hardening
Powder Metallurgy
Introduction to Lightweight Alloys

*Compulsory
MSE department at IIT Kanpur is endowed with world class facilities which allow students to learn vital skills and obtain hands-on experience of latest technologies used both in industries and academia. Apart from the various testing and characterization laboratories, the department also houses befitting computational and modelling facilities in the domain of steel making, fluid dynamics and solidification processing. We have the following labs in our department:

- **Microstructure Characterization Facility**
  - SEM
  - APT
  - TEM
  - EPMA
  - XRD

- **Physical Metallurgy and Engineering Metallurgy Lab**
  - Optical Microscopes
  - Microwave Sintering Furnace
  - Rolling Mill
  - Welding, Brazing

- **Electronic Materials and Thin Film Processing Lab**
  - Pulse Laser Deposition
  - Clean Room
  - Electron-Beam Evaporation
  - Sputtering
  - Photolithography

- **Material Testing Lab**
  - UTM
  - Fatigue Testing
  - Creep Testing
  - Impact Testing
  - Hardness Testing
  - Microhardness Testing

- **XRD**: X-ray Diffraction
- **AFM**: Atomic Force Microscopy
- **BET**: Brunauer-Emmett-Teller
- **XPS**: X-ray Photoelectron Spectroscopy
- **DSC/TGA**: Differential Scanning Calorimetry/Thermogravimetric Analysis
- **UTM**: Universal Testing Machine
Research Highlights

**Research Centres**

- **SAMTEL Centre for Display Technologies**
  To conduct R&D so as to nurture and support the growth of science and technology of electronic displays and to establish a tripartite relationship between industry, academia and governmental agencies.

- **ICME Integrated Computational Materials Engineering**
  Integrated Computational Materials Engineering is a National Hub at IIT Kanpur - A Joint IITK-TCS Initiative

- **ACMS Advanced Centre for Materials Sciences**

- **NC Flexe National Centre for Flexible Electronics.**
  It acts as a nodal point in India to bring academia, industry and public research organizations under one umbrella for research and development of large area flexible electronics

**Industry Partners**

- Applied Materials, Manipal Technologies, Chain electronics, Mathura manufacturing

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**Conferences/Workshops held in IIT Kanpur in the academic area 2018-19**

- Microstructural Engineering conference
- Samsonov Memorial International Lecture series
- An in-house workshop on modelling of steel making processes
- Steelmaking, refractories and plant practices
- Fundamentals and Characterization of Solar Cells (FUNSOL 2019)
- 3D and 4D Microscopy in Materials Science
- Mastering Advanced Techniques of Characterization for High-end Research

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**Papers Published**

Every year hundreds of research papers are published in the reputed journals. A total of 130 papers were published in the academic year 2018-19.
On going projects

- Steelmaking, Process Modelling
- Flexible electronics, materials and devices, semiconductor materials, Organic Electronics
- Computational Materials Science, Finite Element Method, Integrated Computational Materials Engineering
- Physical Metallurgy, Phase Transformation
- Biomaterials, Protein Patterning
- Multi-component Diffusion, Thermodynamics
- Powder Metallurgy, Ceramic Processing, Sintering, Solid Oxide Fuel Cells
- Grain Boundary Engineering, Severe Deformation Processing
- Mechanical Behaviour of Materials
- Stereology, Crystallography
- Glassy Alloys, Quasicrystals
- Nanomaterials/ Composites
- 3D and additive Manufacturing
Material Advantage is a window providing access to the materials professional's most eminent societies like ASM, TMS, AIST and Acers.

IIM Indian Institute of Metals - Kanpur chapter organizes Materials Quiz workshops and conferences, involving student-faculty interaction.

MSES Materials Science and Engineering Society is an integral student body which organises various departmental seminars, workshops, recreational activities.

**Departmental Activities**

**Industry visit** Regular industrial visits to help students better understand the concepts and complexities involved in large scale productions.

**Research Scholars Day** Students exhibit their research work by giving seminars and poster presentations.

**Fun activities** Department outings, friendly volleyball & football matches among faculty & students.

**Department Bodies**

**MA**

**IIM**

**MSES**
Gouthama
Ph.D(I.I.Sc Bangalore)
Specialization: Electron Microscopy, Physical Metallurgy

Kalol Mondal
Ph.D(IIT Kharagpur)
Specialization: Environmental Degradation, Physical Metallurgy, Steel, Glassy Alloys, Corrosion

Kaustubh Kulkarni
Ph.D(Purdue University, U.S.A)
Specialization: Multicomponent Diffusion and Phase Equilibria, Automobile Materials; Materials and Process Design

Shashank Shekhar
Ph.D(Purdue University, U.S.A)
Specialization: Thermomechanical Processing, Material Interface

Tanmoy Maiti
Ph.D (Penn State, U.S.A)
Specialization: Electronic Materials, Thermoelectrics, Perovskites, Plasmonics

Nilesh Prakash Gurao
Ph.D (I.I.Sc Bangalore)
Specialization: Crystallographic Texture, Thermomechanical Processing and Mechanical Behavior of Materials

Sudhanshu Shekhar Singh
Ph.D (Arizona State University, U.S.A)
Specialization: 3D/4D Materials Science, Mechanical Metallurgy

Vivek Verma
Ph.D (Penn State University, U.S.A)
Specialization: Biomaterials, Protein Patterning, Biodegradable Materials

Krishanu Biswas
Ph.D (I.I.Sc Bangalore)
Specialization: Nanomaterials, Phase Transformation, Electron Microscopy, Graphene

Anshu Gaur
Ph.D (University of Illinois, U.S.A)
Specialization: Electronic Materials, Nanomaterials, Device Physics and Device Characterization

Somnath Bhowmick
Ph.D (I.I.Sc Bangalore)
Specialization: Computational Materials Science
Monica Katiyar  
Ph.D (University of Illinois, Urbana Champaign, U.S.A)  
Specialization: Opto-electronic Materials and Devices

Dipak Majumdar  
Ph.D (McGill University, Canada)  
Specialization: Steelmaking, Modeling

Sandeep Sangal  
Ph.D (University of Manitoba, Canada)  
Specialization: Physical and Mechanical Metallurgy

Ashish Garg  
Ph.D (University of Cambridge, U.K)  
Specialization: Electronic Materials and devices

Kantesh Balani  
Ph.D (Florida International University, U.S.A)  
Specialization: Biomaterials, Ultra-high Temperature Ceramics, Nanocomposites, Energy Materials, Nanomechanics

Rajdip Mukherjee  
Ph.D (I.I.Sc Bangalore)  
Specialization: Microstructure Modelling and Simulations

Deepak Gupta  
Ph.D (University of California, Berkeley, U.S.A)  
Specialization: Displays, Oxide TFTs and Memories

Anish Upadhyaya  
Ph.D (Penn State University, U.S.A)  
Specialization: Powder Metallurgy, Sintering of Ferrous and Non-ferrous Alloys and Composites

Amarendra Kumar Singh  
Ph.D (I.I.Sc Bangalore)  
Specialization: Physical Metallurgy and Materials Science

Rajiv Shekhar  
Ph.D (University of California, Berkeley, U.S.A)  
Specialization: Non-ferrous Extractive Metallurgy, Electrometallurgy, Concentrated Solar Thermal Power for Materials Processing, Electromediation of Heavy Metal Contaminated Soil

Shobith Omar  
Ph.D (University of Florida)  
Specialization: Defect Chemistry in Solids, Oxygen Ion Conductors, Thermal Barrier Coatings, Solid Oxide Fuel Cell Technology
Notable Alumni

Dr. Premnath Rai Sinha
Founder Dean of ISB

Mr. B.K. Shah
Founder and Managing Director of AIA Engineering

Dr. Debashish Bhattacharjee
Vice President of New Materials Business, Tata Steel

Mr. Prashasta Seth
Appointed to the board of directors of Chennai-based speech-recognition startup ‘Uniphore Software’

Dr. Veena Sahajwalla
Director of the UNSW SM@RT Centre for Sustainable Materials Research and Technology

Dr. Indranil Chattora
Chief Scientist & Head, HR, CSIR-NML, Jamshedpur

Mr. Kshitij Garg
Founder healthcare start-up ‘Healers At Home’

Mr. Farid Ahsan
Co-founder of ShareChat

Mr. Vivek Pandey
Founder of Bike taxi and hyperlocal delivery app NOW

Prof. Jagdish Narayan
Member of the National Academy of Engineering, USA

Dr. Jayanta Bandyopadhyay
Observer, Analyst and Author (internationally renowned professional on public interest research)
Industry Collaborations

* Not complete list
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