

भारतीय प्रौद्योगिकी संस्थान कानपुर
Indian Institute of Technology Kanpur

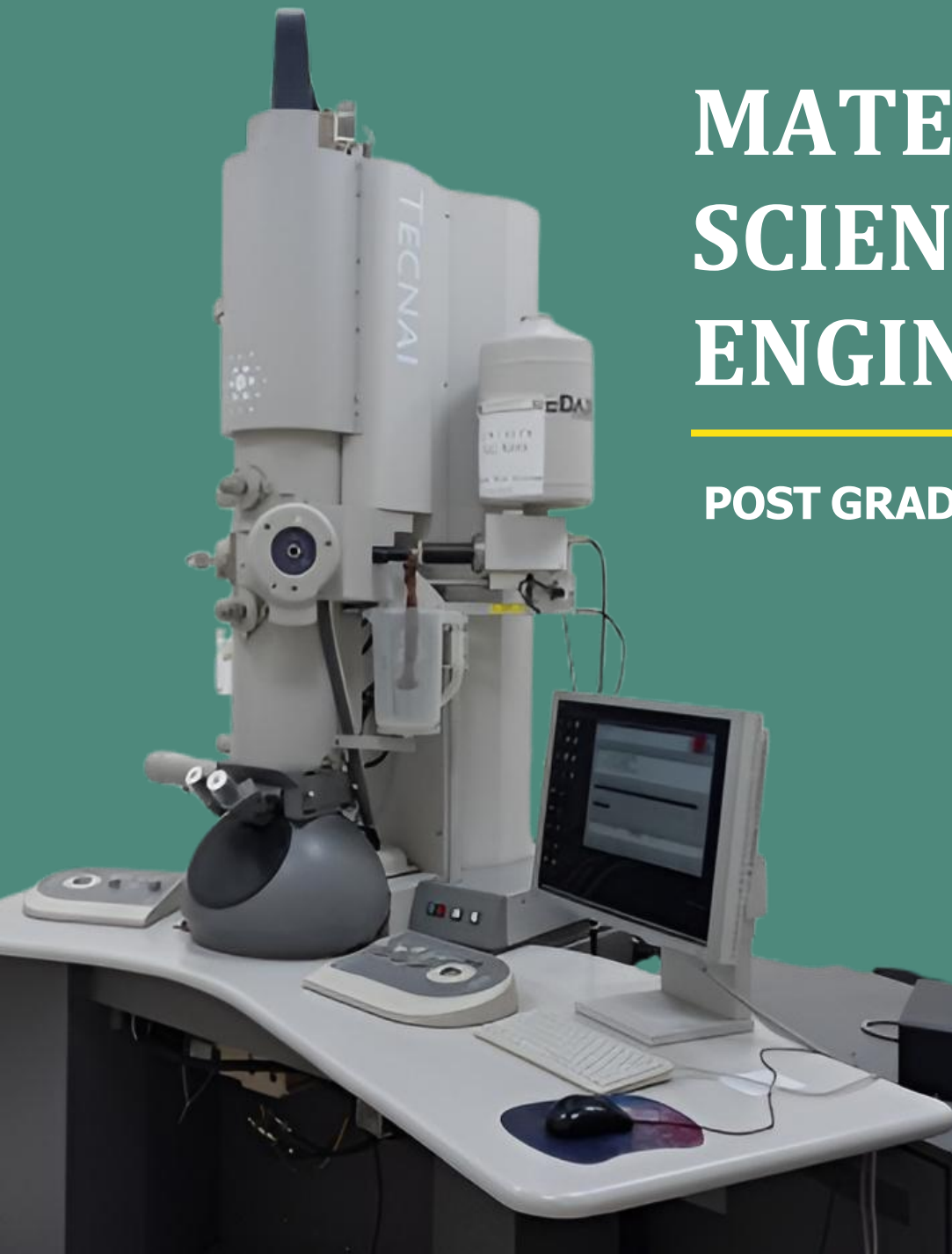


MATERIALS SCIENCE AND ENGINEERING

POST GRADUATE PROGRAM



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MATERIALS SCIENCE AND ENGINEERING

The Department of Materials Science and Engineering at IIT Kanpur is internationally recognized for its excellence in education, research, and innovation. Supported by a distinguished faculty and a vibrant research ecosystem, the department advances cutting-edge work spanning fundamental science to technology-driven applications. It offers a dynamic learning environment at both undergraduate and postgraduate levels, integrating rigorous academics with hands-on research experience. The department hosts a comprehensive suite of state-of-the-art experimental and computational facilities, complemented by the institute's central research facility, which houses sophisticated instrumentation for advanced materials synthesis, processing, and characterization.

The department actively pursues frontier research across both conventional and emerging areas of materials science and engineering. Its research portfolio spans a wide spectrum of materials — including metals and alloys, ceramics, semiconductors, polymers, biomaterials, and composites. The outcomes of these research efforts have direct relevance to key technological domains such as healthcare, renewable energy, transportation, automotive applications, defence, aerospace, and consumer electronics.

MAJOR RESEARCH AREAS

- Biomaterials
- Computational Materials Science and Process Modelling
- Electrochemistry and Corrosion Science
- Energy and Environment Related Materials for Solar Cells, Fuel cells and Hydrogen Storage
- Extractive, Process and Powder Metallurgy
- Functional materials (e.g. Optical, Magnetic, Optoelectronic and Multiferroic) and Devices such as Memories, Displays and LEDs
- Mechanical Behaviour of Materials
- Physical Metallurgy



CAREER OPPORTUNITIES

The postgraduate alumni of the department have an outstanding placement record. Many of our graduates have distinguished themselves as faculty members at premier academic institutions such as the IISc, various IITs, NITs, and reputed universities across the globe. Others have excelled as scientists and researchers in leading national laboratories, including ISRO, BARC, IGCAR, NML, and DRDO, among others. In addition, our alumni have made significant contributions to industry, holding key positions in renowned organizations such as Tata Steel, Tata Motors, Ashok Leyland, Mahindra, GE, GM, SAIL, Micron, Moser Baer, BHEL, and JSW Steel. Beyond core sectors, our students have also carved successful careers in the IT and finance domains, reflecting the versatility and excellence of their training.

ACADEMIC ENVIRONMENT

In addition to their academic and research pursuits, our students are actively engaged in the activities of professional societies such as Materials Advantage and the Indian Institute of Metals (IIM). The Institute provides generous opportunities and financial support for postgraduate students to present their research at national and international conferences. Students also gain valuable teaching experience through teaching assistantships and tutorships, which complement their academic training.

The Institute strongly encourages research dissemination and recognizes students for publications in reputed peer-reviewed journals. Beyond academics, students are offered abundant opportunities to participate in a variety of extracurricular, cultural, and sports activities, fostering holistic personality development and leadership skills



PG ADMISSIONS

Candidates holding an M.Tech./M.E. or B.Tech./B.E. degree in Metallurgical Engineering, Ceramic Engineering, Materials Science and Engineering, Mechanical Engineering, or other relevant engineering disciplines are eligible to apply. In addition, exceptionally bright candidates with an M.Sc. degree in Materials Science, Physics, Chemistry, or Biology (with Mathematics at the undergraduate level) are also encouraged to apply for the Ph.D. program.

The minimum qualification for admission to the M.Tech. program is a B.E./B.Tech./B.S. degree in Metallurgical Engineering, Ceramic Engineering, Materials Science and Engineering, Mechanical Engineering, or other relevant engineering disciplines, or an M.Sc. degree in Materials Science, Physics, or Chemistry. In addition, candidates must have a valid GATE score in the appropriate discipline. Further details can be found at <http://www.iitk.ac.in/mse/academics>.

RESEARCH FACILITIES

The department houses comprehensive synthesis and processing facilities that enable the fabrication of materials in both bulk and thin-film forms. These include specialized melting units and high-temperature furnaces, as well as facilities for physical and chemical thin-film deposition. Advanced processing capabilities such as spark plasma sintering (SPS) and conventional mechanical processing units—including rolling, swaging, and hot pressing—are also available. In addition, the department is equipped with mammalian and bacterial cell culture laboratories to support biomaterials research.

For device fabrication, the department maintains Class 100 and Class 10,000 cleanroom facilities, ensuring controlled environments for high-precision material and device development.

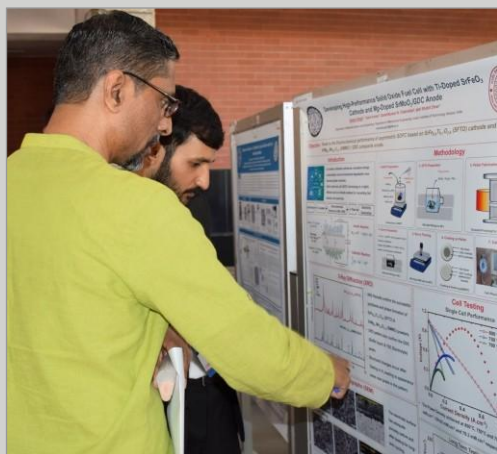
Characterization facilities in the department include microscopy setups comprising Raman and photoluminescence spectroscopies, optical and electron microscopes (SEM, TEM, FE-SEM), an atomic force microscope (AFM), powder and thin-film X-ray diffractometers, and thermogravimetric analysis instruments. The department also houses state-of-the-art facilities for sample preparation and for the measurement of a complete range of mechanical, electrical, optical, magnetic, and functional properties.



POST GRADUATE COURSES

Postgraduate students have the flexibility to choose from a wide range of fundamental and advanced courses spanning diverse areas of materials science and engineering. In addition to fulfilling the thesis requirement, students must complete a prescribed set of coursework, the extent of which depends on their academic background and prior degree.

A comprehensive list of available courses, detailed information on course requirements, and the research interests of faculty members can be found on the department website: <http://www.iitk.ac.in/mse/>



PG Coursework

<https://iitk.ac.in/mse/pg-syllabus-25>

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

POST-GRADUATE PROGRAMMES OFFERED

- **Doctor of Philosophy (Ph.D.)**
<https://iitk.ac.in/mse/phd>
- **Master of Technology (M.Tech.)**
<https://iitk.ac.in/mse/mtech>



LABS/FACILITIES

The list of Departmental facilities can be found in
<https://www.iitk.ac.in/mse/MSE-Facilities/index.html>



Microstructure Characterization Facility

Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM)
Transmission Electron Microscopy (TEM), Brunauer-Emmett-Teller (BET)
Electron Probe Micro Analyzer (EPMA), Thermogravimetric Analysis (TGA)
and Differential Scanning Calorimetry (DSC), X-Ray Diffraction (XRD),
X-Ray Photoelectron Spectroscopy (XPS)



Physical Metallurgy and Engineering Metallurgy Lab

Optical Microscopy
Microwave Sintering Furnace
Rolling Mill

Welding
Brazing



Electronic Materials and Thin Film Processing Lab

Pulse Laser Deposition
Electron-Beam Evaporation
Photolithography

Clean Room
Sputtering



Material Testing Lab

Universal Testing Machine
Fatigue Testing
Creep Testing

Impact Testing
Hardness Testing
Microhardness Testing



FACULTY LIST



Nilesh Badwe
Ph.D. (Arizona State University, Tempe, USA)
Office: Faculty Building 412B Phone: 2205
Lab: Western Labs 214 Phone: 7934
Specialization: Mechanical properties of materials, Microelectronics packaging, Nanoporous metals, Electrodeposition of nanocrystalline alloys, Interconnect materials



Head of the Department
Kantesb Balani
Ph.D. (Florida International University, Miami, USA)
Office: Laboratory for Biomaterials Phone: 6194
Lab: Laboratory for Biomaterials Phone: 7920
Specialization: Biomaterials, Ultra High Temperature Ceramics, Coatings, Computational Modeling, Nanomechanics & Tribology, CNT Reinforced Nanocomposites



Somnath Bhowmick
Ph.D. (IISc, Bangalore, Bengaluru, India)
Office: Faculty Building 410 Phone: 7161
Lab: Western Labs 312A Phone: 6703
Specialization: Computational Materials Science



Krishanu Biswas
Ph.D. (IISc, Bangalore, Bengaluru, India)
Office: Western Labs 210 Phone: 6184
Lab: Western Labs 210 Phone: 7710
Specialization: Alloy Design, Multicomponent Materials, Phase Transformations, Electron Microscopy, Waste to Wealth



Niraj Mohan Chawake
Ph.D. (IIT Madras, Chennai, India)
Office: Faculty Building 417 Phone: 2181
Lab: Western Labs 214 Phone: 7934
Specialization: Creep, Mechanical Behavior of Materials, Solid-State Sintering



Anshu Gaur
Ph.D. (University of Illinois, Urbana-Champaign, USA)
Office: Faculty Building 405 Phone: 7600
Lab: Western Labs 312 Phone: 6771
Specialization: Electronic Materials, Nano-Materials, Device Physics and Device Characterization



Srinu Gangolu
Ph.D. (IIT Bombay, Mumbai, India)
Office: WL306A Phone: 2317
Lab: Old Workshop 101 Phone: 6129
Specialization: High-Temperature Deformation, Metal matrix composites and Structure-Property Correlation



Nilesh Prakash Gurao
Ph.D. (IISc Bangalore, Bengaluru, India)
Office: Western Labs 210A Phone: 6688
Lab: Western Labs 209A Phone: 7757
Specialization: Crystallographic Texture, Thermochemical Processing and Mechanical Behaviour of Materials



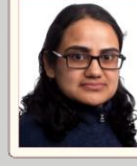
Sarang Ingole
Ph.D. (Arizona State University, Tempe, USA)
Office: Western Labs 210B Phone: 7089
Lab: Western Labs 204 Phone: 6794
Specialization: Semiconductor Materials, Micro and Nano-fabrication, Electrical Characterization of Materials



Shikhar Krishn Jha
Ph.D. (University of Colorado, Boulder, USA)
Office: Western Labs 303D Phone: 2094
Lab: Western Labs 303C Phone: 6129
Specialization: Advance material processing under externally applied fields and its effect on electrical, optical, and chemical properties of the materials



Monica Katiyar
Ph.D. (University of Illinois, Urbana-Champaign, USA)
Office: Western Labs 1138 Phone: 7941
Lab: Western Labs 105 Phone: 7935
Specialization: Printed and Flexible Electronics-Organic Light Emitting Diodes and Flexible Batteries, Thin-Film Technology, Electronic Materials and Devices: Characterization and Processing



Heena Khanchandani
Ph.D. (Max-Planck-Institute for Iron Research, Dusseldorf, Germany)
Office: Faculty Building 406 Phone: 2610
Lab: Mezzanine floor (Workshop 106) Phone: N.A
Specialization: Physical Metallurgy, Advanced high strength steels



Kaustubh Kulkarni
Ph.D. (Purdue University, West Lafayette, USA)
Office: Western Labs 302A Phone: 6102
Lab: Western Labs 209 Phone: 6060
Specialization: Multicomponent Diffusion, Thermodynamics, Physical Metallurgy



Tanmoy Maiti
Ph.D. (PennState, Camp Hill, USA)
Office: Western Labs 302B Phone: 6599
Lab: Western Labs 204A Phone: 6802
Specialization: Renewable Energy, Thermoelectrics, Perovskite Solar Cell, Electro-Ceramics, Pyro/Ferro-electrics, Plasmonics, RRAM



Emeritus Faculty
Dipak Mazumdar
Ph.D. (McGill University, Montreal, Canada)
Office: Western Labs 101 Phone: 7328
Lab: Western Labs 101A Phone: 7977
Specialization: Steelmaking, Modeling



Arunabh Meshram
Ph.D. (IIT BHU, Varanasi, India)
Office: Faculty Building 409 Phone: 2268
Lab: Western Labs 101 Phone: N.A
Specialization: Non-Ferrous Extractive Metallurgy



Shikhar Misra
Ph.D. (Purdue University, West Lafayette, USA)
Office: Faculty Building 411 Phone: 2257
Lab: Old Workshop 103 Phone: 6129
Specialization: Functional thin films, epitaxy, ceramic nanocomposites, optical metamaterials



Kallol Mondal
Ph.D. (IIT Kharagpur, Kharagpur, India)
Office: Western Labs 113A Phone: 6156
Lab: Western Labs 205 Phone: 7648
Specialization: Environmental degradation, Corrosion, Glassy coatings, Green inhibitor, Anodes, Steel, Physical Metallurgy



Rajdip Mukherjee
Ph.D. (IISc Bangalore, Bengaluru, India)
Office: Faculty Building 407 Phone: 6449
Lab: Western Labs 312B Phone: 6903
Specialization: Microstructure Modelling & Simulation



Shobit Omar
Ph.D. (University of Florida, Gainesville, USA)
Office: ACMS 203E Phone: 7427
Lab: Western Labs 109, 207 Phone: 6750
Specialization: Electrodes, Solid Electrolyte, Ceramic Processing, Sodium-ion Batteries, Solid Oxide Fuel Cells, Supercapacitors, & Electrolyzers



Sandeep Sangal
Ph.D. (University of Manitoba, Winnipeg, Canada)
Office: Western Labs Extension 114 Phone: 7167
Lab: Western Labs Extension 116 Phone: 7959
Specialization: Physical and Mechanical Metallurgy



Rahul Sarkar
Ph.D. (University of Utah, Salt Lake, USA)
Office: Faculty Building FB-403 Phone: 2242
Lab: Western Labs 101C Phone: 7977
Specialization: Iron and Steelmaking, Refractory interactions, High temperature chemical processing



Shashank Shekhar
Ph.D. (Purdue University, West Lafayette, USA)
Office: Western Labs 304A Phone: 6528
Lab: Western Labs 104D, 304B Phone: 6278, 6479
Specialization: Severe Plastic Deformation Grain Boundaries, Triple Junctions



Amarendra Kumar Singh
Ph.D. (IIT Kanpur, Kanpur, India)
Office: Western Labs 101 Phone: 6810
Lab: Western Labs 101C Phone: 6277
Specialization: Process Modelling & Simulations



Sudhanshu Shekhar Singh
Ph.D. (Arizona State University, Tempe, USA)
Office: Western Labs 303A Phone: 6908
Lab: Western Labs 303B Phone: 6480
Specialization: Deformation behavior of materials, Laser assisted processing of materials, Structure-property correlation



Shivam Tripathi
Ph.D. (Purdue University, West Lafayette, USA)
Office: Faculty Building 416 Phone: 2426
Lab: Mezzanine floor (Workshop 104) Phone: N.A
Specialization: Atomistic Simulations, Thermodynamics, Physical Metallurgy



Anish Upadhyaya
Ph.D. (PennState, Camp Hill, USA)
Office: Faculty Building 419 Phone: 7672
Lab: Western Labs 208 Phone: 7342
Specialization: Powder Metallurgy, Sintering of Ferrous & Non-Ferrous Alloys & Composites



Vivek Verma
Ph.D. (PennState, Camp Hill, USA)
Office: Faculty Building 418 Phone: 6527
Lab: Western Labs 206, CESE 201 Phone: 6949, 6261
Specialization: Biomaterials, Biodegradable Polymers



Raghupathy Yuvaraj
Ph.D. (IISc Bangalore, Bengaluru, India)
Office: WL306B Phone: 2316
Lab: Old Workshop 102 Phone: 6228
Specialization: Structure-electrochemical property relationships in metastable and nanocrystalline materials, development of materials for extreme corrosive environments, coatings for corrosion control

BROAD RESEARCH AREAS

- AI and ML for Materials Science and Engineering
- Biomaterials
- Computational Materials Science
- Corrosion and Oxidation
- Electroceramics
- Extractive Metallurgy
- Flexible and Organic Electronics
- Manufacturing Processes
- Material Degradation
- Mechanical behaviour of Materials
- Nanomaterials and Nanotechnology
- Physical Metallurgy
- Powder Metallurgy
- Process Modelling
- Structural Ceramics



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-  www.linkedin.com/in/mse-iit-kanpur-18236516b/

