



INDIAN INSTITUTE OF TECHNOLOGY KANPUR

**MATERIALS SCIENCE PROGRAMME**

**PLACEMENT BROCHURE  
2015-16**

## FROM HOD'S DESK



*DR. YASHOWANT MOHAPATRA  
HEAD OF THE DEPARTMENT  
MATERIALS SCIENCE PROGRAMME*

## PROFESSOR INCHARGE'S DESK



*Dr. Siddhartha Panda  
Professor In - charge  
Materials Science Programme*

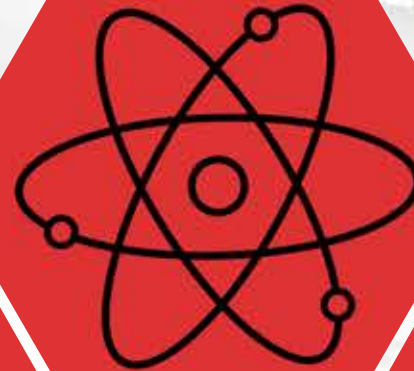
A strong interdisciplinary approach to Materials Science education and research is the primary feature in the Programme at IIT Kanpur. The training that the students receive through coursework and research seeks to homogenise their background irrespective of their undergraduate disciplines. It also gives them that much needed peek into the problems at the frontier through the M.Tech. and Ph.D. Projects. This makes them battle ready for real life problems in advanced materials and their applications. Our focus on fundamentals as a tool-box of ideas from a variety of fields, with actual engineering applications as exemplars, provides them a unique interdisciplinary experience. They learn from and work with faculty drawn from both engineering and science, empowering them to lower the barrier towards learning from another unfamiliar field. They become open to a variety of new problems and challenges. The benefits of our approach have been proven over the last three decades. We keep our training abreast of the latest in the field and improve our strategies. I am sure future employers and students will continue to discover the strength of their training here in decades to come in their professional life – no matter what area they adapt .

Education here at IIT Kanpur is the prime focus of a student. The Interdisciplinary Programme in Materials Science has a conglomeration of eminent faculties from Physics, Mechanical Engineering, Chemistry, Chemical Engineering and Electrical Engineering departments guiding students towards their Postgraduate Degrees. The interdisciplinary learning has succeeded the programme to accomplish a vast number of research publications and an excellent placement record. The impetus behind the multifarious research in genres like semiconductor device modelling, multiferroics, microwave absorbers, composites and chemical sensors is the need to develop novel materials and products to satiate the growing demands of the world. Bringing together the innumerable components of science and technology and to get them working in tandem has been a key challenge and I am glad that the students have been able to embrace it well. I wish the students all the best for the placement session of 2015-16.

**VISION**

**VISION**

**PHYSICS**



**CERAMICS  
&  
PRODUCTION**



**CHEMICAL  
&  
CHEMISTRY**



**MASTER OF TECHNOLOGY**

**MATERIALS  
SCIENCE  
PROGRAMME**

**DOCTOR OF PHILOSOPHY**

**ELECTRICAL  
&  
ELECTRONICS**



**METALLURGY  
&  
MATERIALS**



**MECHANICAL**



*Materials are at the root of man's progress in the modern world. Advances in technology today are limited by the availability of newer materials with desired properties. Thus, the development of solar cell materials would make greater use of solar energy feasible, ceramic materials would make automobile and other engines lighter and more fuel efficient, optoelectronic materials would revolutionize the communication industry, etc. For this, a thorough study of existing materials and tailor making of new functional materials are to be continued with increasing vigour. Such a task, however, requires an integrated approach to the subject using established principles of science and engineering. Keeping this objective in view and to provide focus and coordination for teaching, research and development, an **INTERDISCIPLINARY PROGRAM IN MATERIALS SCIENCE** was initiated at IIT, Kanpur at the postgraduate level in July 1971.*

## **Laboratories**

- **Advanced Nano-Engineering Materials Lab**
- **Solid State Ionics Lab**
- **Electron microscopy Lab**
- **Magnetic Testing Lab**
- **Surface Characterization Lab**
- **X-Ray Diffraction Facility**
- **Materials Science Instructional Lab**
- **Thin Films Lab**
- **Electrical Characterization Lab**
- **Mechanical Testing Lab**
- **Slow-Strain Rate testing lab**
- **XRF-IRMS Lab**
- **Optical Spectroscopy Lab**
- **Central Facilities**
- **Indentation Lab**
- **Powder Size Characterisation Facility**
- **Texture Lab**
- **Photonic And Electronic Materials Lab**
- **BET;FTIR; and BET Solar Simulator Facility**
- **Live Cell Imaging Lab**
- **Sample Preparation Lab**
- **Thermal Analysis Lab**

## **Major Facilities Available**

- **Transmission Electron Microscope**
- **Scanning Electron Microscope**
- **Rutherford Back Scattering Spectrometer**
- **PC Interfaced I-V Measurements (40-310K)**
- **Controlled Atmosphere Glove Box**
- **Mossbauer Spectrometer, NMR, EPR**
- **Vacuum Coating Units With E-Beam / Thermal Evaporation**
- **Thin Film Preparation/Characterization**
- **Atomic Force Microscope**
- **DC/AC, Two/Four Probe Resistivity Measurement Set Up (10-1800K)**
- **Liquid Helium Plant**
- **Fuel Cell Test Rig**
- **Diamond Saw**
- **Materials Testing System (UTM)**
- **X-Ray Powder Diffractometer**
- **Electron Probe Micro Analyzer**
- **Twin Roller & Iso-static press**
- **PECVD**
- **Ceramic Processing Facilities**
- **Deep Level Transient Spectroscopy**
- **Vibrating Sample Magnetometer**

## **REPRESENTATIVE PROJECT NAME**

- **STUDY OF CHALCOGENIDE GLASSES FOR APPLICATION IN MEMORY DEVICES**
- **SYNTHESIS & CHARACTERISATION OF HIGH TEMPERATURE SUPERCONDUCTORS**
- **HIGH PERFORMANCE SURFACE ENGINEERED CARBON- CARBON COMPOSITE FOR HIGH TEMPERATURE APPLICATIONS**
- **DEVELOPMENT OF PROTOTYPE FULL COLOR ORGANICS LIGHT DIODE (O-LED) DISPLAY**

## **REPRESENTATIVE FUNDING AGENCY**

- **AOARD / PHY / 20080066**
- **MINISTRY OF HUMAN RESOURCE DEVELOPMENT, INDIA**
- **DEPARTMENT OF ATOMIC ENERGY, INDIA**
- **DEPARTMENT OF SCIENCE AND TECHNOLOGY, INDIA**

COURSE STRUCTURE

COURSE STRUCTURE

## **Mechanical Properties of Materials**

*Stress strain, Elastic constants, Strength, Toughness, Fatigue, Viscoelasticity, Dislocations and strengthening mechanisms, Dynamic Mechanical Analysis, Creep, Mathematical Modeling, Complex Modulus, Hardness, Crystal Structures, Fracture Mechanics.*

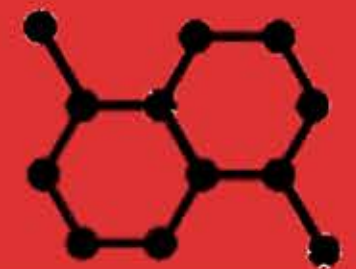


## **Characterization Of Materials**

*X-Ray Spectroscopy, X-Ray Diffraction, X-Ray Fluorescence, X-Ray pattern indexing, Electron Microscopy, Scanning electron microscopy, Transmission electron microscopy, Microwave spectroscopy, Infrared Spectroscopy, Raman Spectroscopy, Thermo gravimetric analysis, Differential Scanning Calorimetry, DTA*

## **Materials Engineering**

*Crystal Growth, Corrosion and it's Mechanisms, Polymer processing - Extrusion, Injection Moulding, Compression Moulding, Ceramic Processing, Czochralski, Bridgeman, Stockbarger Techniques, Epitaxial Growth, Chemical Vapor deposition, Molecular Beam Epitaxy, Non destructive Testing, VNA,  $\mu$  wave charteri<sup>n</sup>*



## **Electrical & Dielectric Properties of Materials**

*Metals- Free Electron Theory, Semiconductors - Energy Band Theory, Doping, P-N Junctions, MOS, Optoelectronics, Solar Cells, Electrical Properties, Dielectric Materials - Ionic Conductivity, Impurity Effect, Low K- High K Materials Piezoelectrics, Ferroelectrics, solid state Electrolytes Pyroelectric Materials, Diodes.*

## **Structural & Magnetic Properties of Materials**

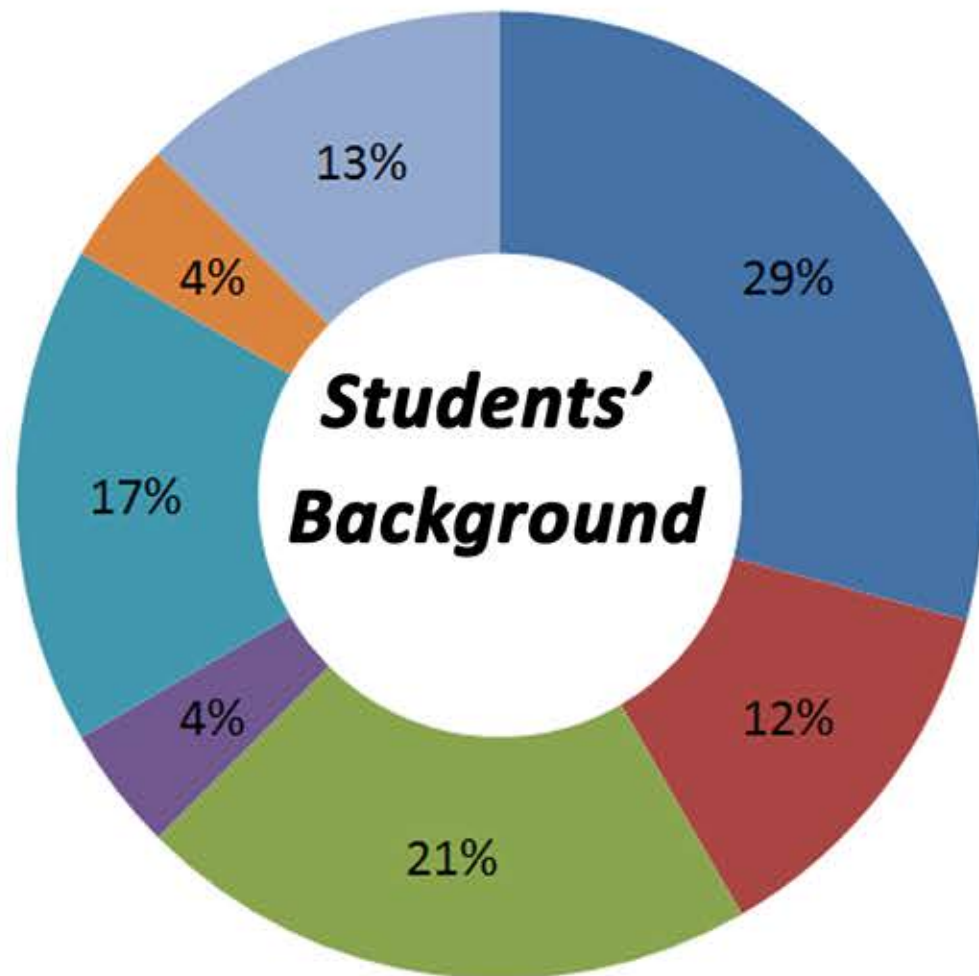
*Crystal Structure, Phase transformations, Atomic Bonding, Magnetic Materials - Diamagnetic, Paramagnetic, Ferromagnetic, Ferrimagnetic, Anti-ferromagnetic, Magnetostriction, Nuclear Magnetic, Resonance, Soft Magnets, Hard Magnets, Superconductors, Nuclear thoery of magnetism , Applications*



## BATCH STATISTICS

### Current Research Areas

- Tribocorrosion: Wear & Corrosion
- Stress corrosion cracking and Atmospheric corrosion
- Materials for flexible bateries
- Heart Valve Design
- Materials for flexible electronics
- Carbon -Carbon composites
- Solid Electrolytes of Li- Ion batteries
- Chemical sensors
- Topological Insulators
- Water splitting electrochemical cell
- TFT based ISFETS
- Micorwave and radio frequency
- Thin-film Multiferroics
- Terraheartz Devices
- =Peroviskite Solar cell
- Carbon nanotube composites



- Mechanical
- Metallurgy
- Electronics
- Electrical
- Physics
- Materials Science
- Ceramics

## BATCH STATISTICS

### Electives Undertaken

- Nanostructures and nanomaterials and properties
- Theory of elastcity
- Finite element analysis
- Machining science
- Material selection in mechanical design
- Monolithic microwave integrated circuits
- Electronic structure of materials
- Composite materials
- Physics of semiconductor nanomaterials
- Process engineering principles in microeletronic fabrication
- Semiconductor device modelling
- Organic electronics
- Digital Switching
- Structural characterization of materials
- Monolithic microwave integrated circuits
- Microwave circuits
- Heat treatment
- Thermodynamics of materials
- Solid state ionics
- Crystallographic texture and microstructural evolution
- XPSand AES



28 %

72%

## FACULTY

## OUR ALUMNI



Dr. Y.N Mohapatra  
Head of the Department  
Ph.D, IISc Bangalore  
ynm@iitk.ac.in



Dr. Jitendra Kumar Ph.D,  
BHU  
jk@iitk.ac.in



Dr. Kamal K. Kar  
Ph.D, IIT Kharagpur  
kamalkk@iitk.ac.in



Dr. J. Akhtar  
Ph.D, University of Magdeburg,  
Germany  
mjakhtar@iitk.ac.in



**RAJIV ARYA**  
CEO - MOSER BAER PHOTOVOLTAIC LTD.



Dr. Siddhartha Panda  
Ph.D,  
University of Houston  
spanda@iitk.ac.in



Dr. J. Ramkumar  
Ph.D, IIT Madras  
jrkmur@iitk.ac.in



Dr. Rajeev Gupta  
Ph.D, IISc Bangalore  
guptaraj@iitk.ac.in



Dr. S. Sivakumar  
Ph.D,  
University of Victoria  
srisiva@iitk.ac.in



**MANVENDRA BHANGUI**  
HEAD, TAGREM INDIA PVT. LTD



Dr. Manas Ghorai  
Ph.D, NCL Pune  
mkghorai@iitk.ac.in



Dr. C. S. Sundar  
Sr Professor at Homi  
Bhabha National  
Institute and  
Visiting faculty



**AMITABH VERMA**  
VICE PRESIDENT

ADITYA BIRLA MANAGEMENT CORPORATION PVT. LTD



**IVAN SAHA**  
PRESIDENT AND CTO  
VIKRAM SOLAR

... AND MANY MORE

PAST RECRUITERS

PAST RECRUITERS

Schlumberger



moserbaer



SanDisk

ORACLE



ABB



RioTinto



Finisar

