



**Material Science Programme
Indian Institute of Technology Kanpur**



**SESSION 2023-2024
PLACEMENT
BROCHURE**

**Student Placement Office
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IIT Kanpur,
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VISIT US at <https://www.iitk.ac.in/msp/>

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WELCOME MESSAGE FROM THE HOD

**Materials Science
Programme
Indian Institute of
Technology
Kanpur**

"It is clear that the strength of even the largest engineering structure depends in part upon chemical and physical events happening upon a molecular scale and so we shall not only have to let our ideas range freely up and down the scale of physical dimensions from the very big to the very small, but we shall also have to jump backwards and forwards from the ideas of chemistry to those of engineering. In the current phrase materials science is 'interdisciplinary'."

-- From "The New Science of Strong Materials or Why You Don't Fall Through the Floor" by J E Gordon (1963)

The interdisciplinary program on Materials Science continues to keep the spirit of the above-mentioned wise words alive. While these lines were written many decades ago, the ever-expanding inroads of materials into technology have necessitated continued rejuvenation of education and research training in the domain of materials science, engineering and technology. Every student and participating faculty of MSP aims to bring to fruition the spirit of inter-disciplinarity, wherein technical problems are viewed with more than one lens. Students with a wide range of training in their undergraduate degrees-typically from Chemistry and Chemical Engineering, Electrical Engineering and Physics, Mechanical Engineering and Instrumentation-are inducted into MSP and first-year courses are designed for cross-pollination of strengths and viewpoints of different departmental ecosystems. Each course is typically taught by two faculty from two different backgrounds. Students graduate to their second phase in training by taking up research challenges at the interface of different disciplines. Such an evolution of students' technical competence makes them ideally suited to wrestle with the many facets of the contemporary industrial material ecosystem, which invariably comprises multidisciplinary teams. We have aspired to inculcate the spirit of lifelong learning in students and we hope such an aptitude will be gainfully employed in your technical troubling environment.

We look forward to your feedback on your technological needs so that we can strategize the training of the next generation of interdisciplinary interlocutors!

A handwritten signature in blue ink, appearing to read "Raj Ganesh S. Pala".

**Dr. Raj Ganesh S .Pala
Professor and Head,
Materials Science Programme
Indian Institute of Technology Kanpur**

About Us



The Interdisciplinary program in Materials Science at IIT Kanpur was established in July 1971 as an early degree program aimed at promoting collaboration across different fields of research and technology. This approach contributes to advancing and enhancing material qualities for several applications, including electronic devices, semiconductors, mechanical systems, nanotechnology, energy storage, stealth technology, and sensing capabilities. Our students engage in a demanding curriculum that includes practical laboratory exercises to characterize different materials' properties. These exercises involve the use of advanced techniques such as Scanning Electron Microscopy (SEM), Raman Spectroscopy, Transmission Electron Microscopy (TEM), X-Ray Diffraction (XRD), X-Ray photoelectron spectroscopy (XPS), and various other materials characterization techniques. The combination of interdisciplinary knowledge acquired by students throughout their course work and their specialized and in-depth subject expertise gained through Ph.D. study makes them strong candidates for both industry application and academia.. GATE scores and a written exam conducted by IIT Kanpur are the selection criteria for this program.

Courses Offered

Structural and Magnetic Properties of materials

- Crystal structure, bonding of atoms & crystal chemistry.
- Equilibrium thermodynamics, phase equilibria, phase transformations.
- Dia-, para-, ferro-, ferri-, and antiferromagnetism.
- Anisotropic effects.
- Magnetic domains, Magnetostriction.
- Measurements of magnetic properties.
- Soft and hard magnetic materials and their technology.

Electrical and Dielectric properties of materials

- Free electron theory.
- Metallic conduction.
- Energy bands.
- Brillouin zones.
- Temperature dependence of metallic conductivity.
- Semiconductor materials & Doping effects.
- P-N junctions, MOS field effect transistors.
- Di-, ferro-, and piezo- electric materials
- Semiconductor technology.

Mechanical Properties of materials

- Stress & strain tensors & elastic constants.
- Effect of structure on elastic behaviour.
- Viscosity and viscoelasticity in polymers.
- Dislocations and plastic deformation of metals and ceramics.
- Creep, brittle fracture in ceramics and glasses.
- Fatigue.
- Mechanical testing.
- Strength and engineering design with brittle solids.

Characterization of materials

- Crystallography.
- Reciprocal lattice.
- Stereographic projections.
- Diffraction methods.
- Electron microscopy.
- Metallography.
- Thermal analysis.
- Chemical analysis.
- Laboratory sessions.

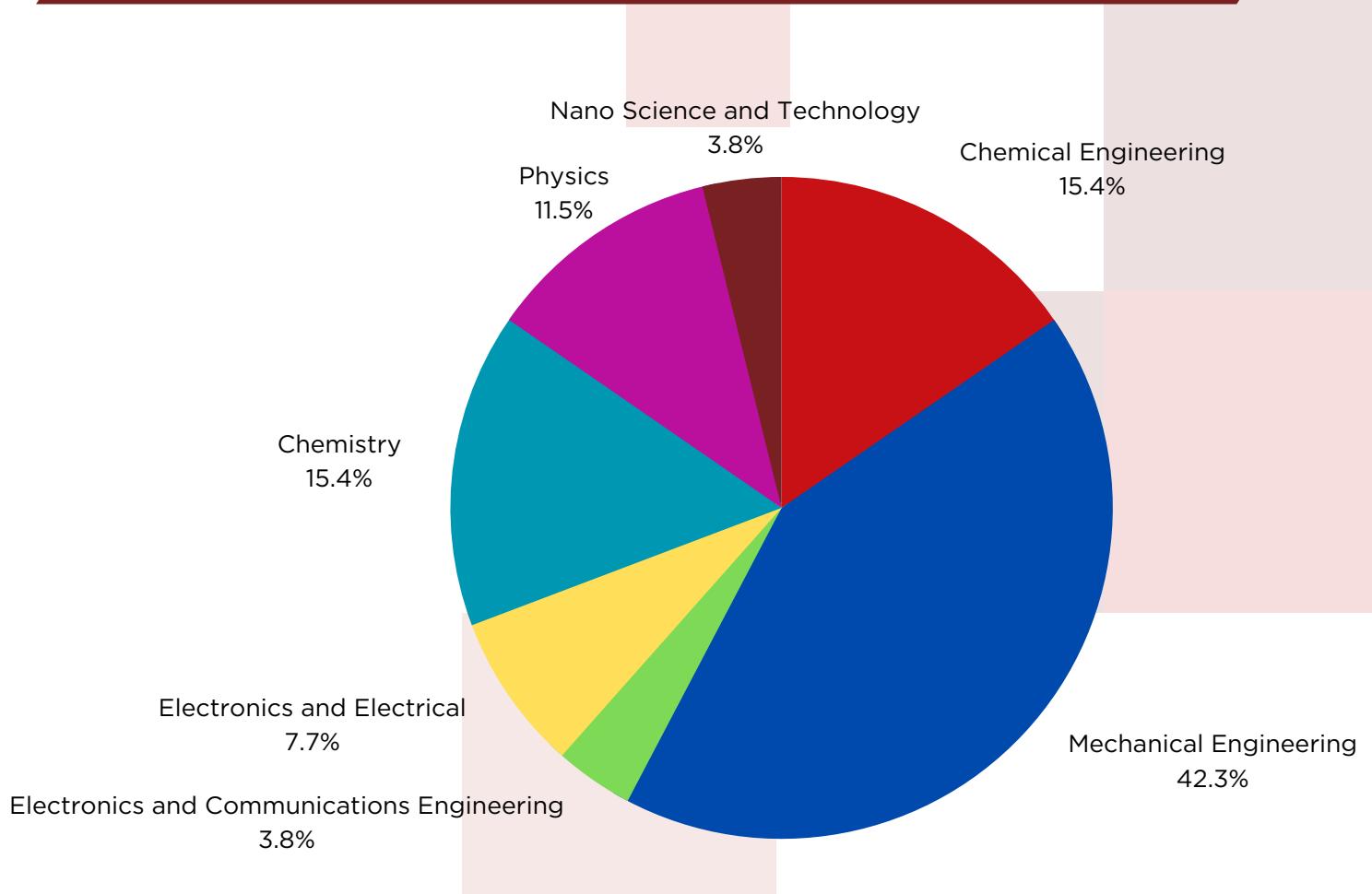
Materials Engineering

- Solidification.
- Powder processing.
- Crystal growth.
- Heat treatment.
- Non destructive evaluation.
- Processing of glasses and polymers.
- Novel processing methods.
- Thin films.
- Surface phenomena and corrosion.

Elective courses offered

- **Engineering Polymers**
- **High performance polymers and composites**
- **Materials selection in mechanical design**

Student Demographics



Research Areas

- **Solid state batteries.**
- **Recycling of Solar PVMs.**
- **Mechanical heart valves.**
- **Printable electronics.**
- **Wearable organic sensors.**
- **Catalysis and nano-catalysts.**
- **RF sensors.**
- **CO₂ reduction to CO.**
- **Nanocomposites & bio-materials.**
- **Experimental condensed matter physics.**
- **Magnetic materials.**
- **Multiferroic systems.**
- **Electronic materials.**
- **Microwave Absorbers.**

Lab Facilities

OPTICAL SPECTROSCOPY

Experimental condensed matter physics with emphasis on using spectroscopy tools such as Raman scattering to probe the nanoscale dynamics in novel and interesting materials

Location : ACMS 107



THIN FILMS LABORATORY

Nano, electronic, magnetic recording and hydrogen energy storage materials, Thin films, Electron microscopy

Location : ACMS 108B

MICROWAVE MATERIALS PROCESSING LABORATORY

Microwave absorbers, Microwave sensors, Stealth technology, Dielectric properties

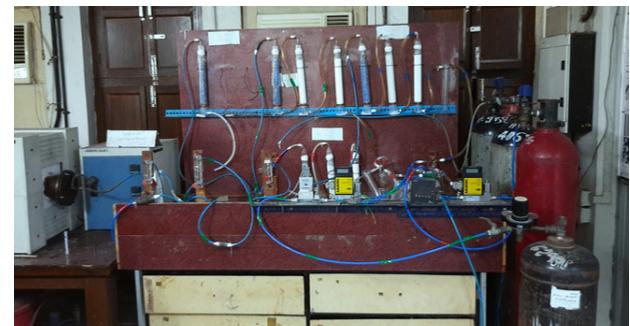
Location: ACMS 207A



Lab Facilities

MATERIALS SCIENCE INSTRUCTIONAL LABORATORY

**Nano, electronic, magnetic
recording and hydrogen energy
storage materials, Thin films,
Electron microscopy**
Location : ACMS 210



ADVANCED NANOENGINEERING MATERIALS LABORATORY

**Carbon nanotubes, Nanostructured
materials, Functionally graded
materials, Fuel cell, Solar cell, Li-
battery, Polymer, Thermoelectric
materials, Nanocomposites**
Location : ACMS 208



Faculty list



Dr. Raj Ganesh S Pala
Professor and Head, PhD
(Physical Chemistry),
University of Utah
Research Interest :
Electrochemical , Catalysis and
Separations Engineering



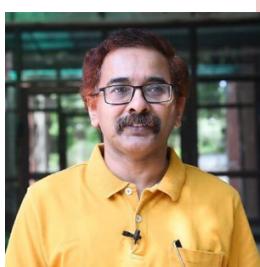
Dr. Kamal K Kar
Professor, PhD,
IIT Kharagpur
Research Interest : Materials
for solar cell, fuel cell, lithium
battery, high performance
structural composites



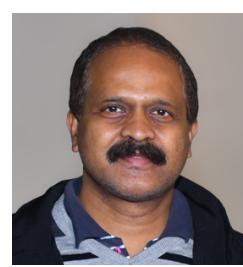
Dr. Rajeev Gupta
Professor
PhD, IISc Bangalore
Research Interest :
Experimental condensed
matter physics



Dr. M. Jaleel Akhtar
Professor, PhD, University of
Magdeburg , Germany
Research Interest : Microwave
imaging and non-destructive
testing , RF and microwave
sensors



Dr. Sri Sivakumar
Professor ,Ph.D., University of
Victoria, Canada
Research Interest: Synthesis and
Characterization of
Nanomaterials,
Novel nano-catalyst



Dr. Siddhartha Panda ,
Professor
Ph.D., Chemical Engineering,
University of Houston
Research Interest : Chemical
sensors, Transport and reactions
Microfluidics Micro/nano
fabrication Semiconductor devices



Dr. Y. N. Mohapatra
Professor
PhD, IISc Bangalore
Research Interest : Printable
Electronics and nano
patterning



Dr. Pritam Chakraborty
Associate Professor
PhD, The Ohio State University, USA
Research Interest : Solid mechanics
to understand plasticity, fatigue,
creep and fracture from a micro-
structural length scale



Dr. Amit Verma
Associate professor
PhD, University of Notre Dame,
IN, USA
Research Interest : Materials
Growth for semiconductor
device fabrication,
characterization and modeling

Distinguished Alumni



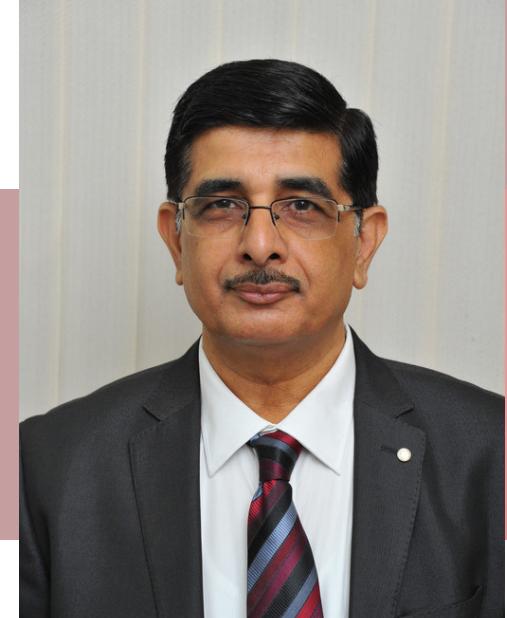
Manvendra Bhangui
Founder, Indimail



Rajiv Arya
Founder, Arya International



Ivan Saha
CEO , Vikram Solar



Amitabh Verma
**VP. -Aditya Birla
Management Corp.
Pvt. LTd.**

Past Recruiters



FINISAR®



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& Company

AM/NS
INDIA

TIGER
ANALYTICS



APPLIED
MATERIALS
make possible

Schlumberger

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EY



Contact Us

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