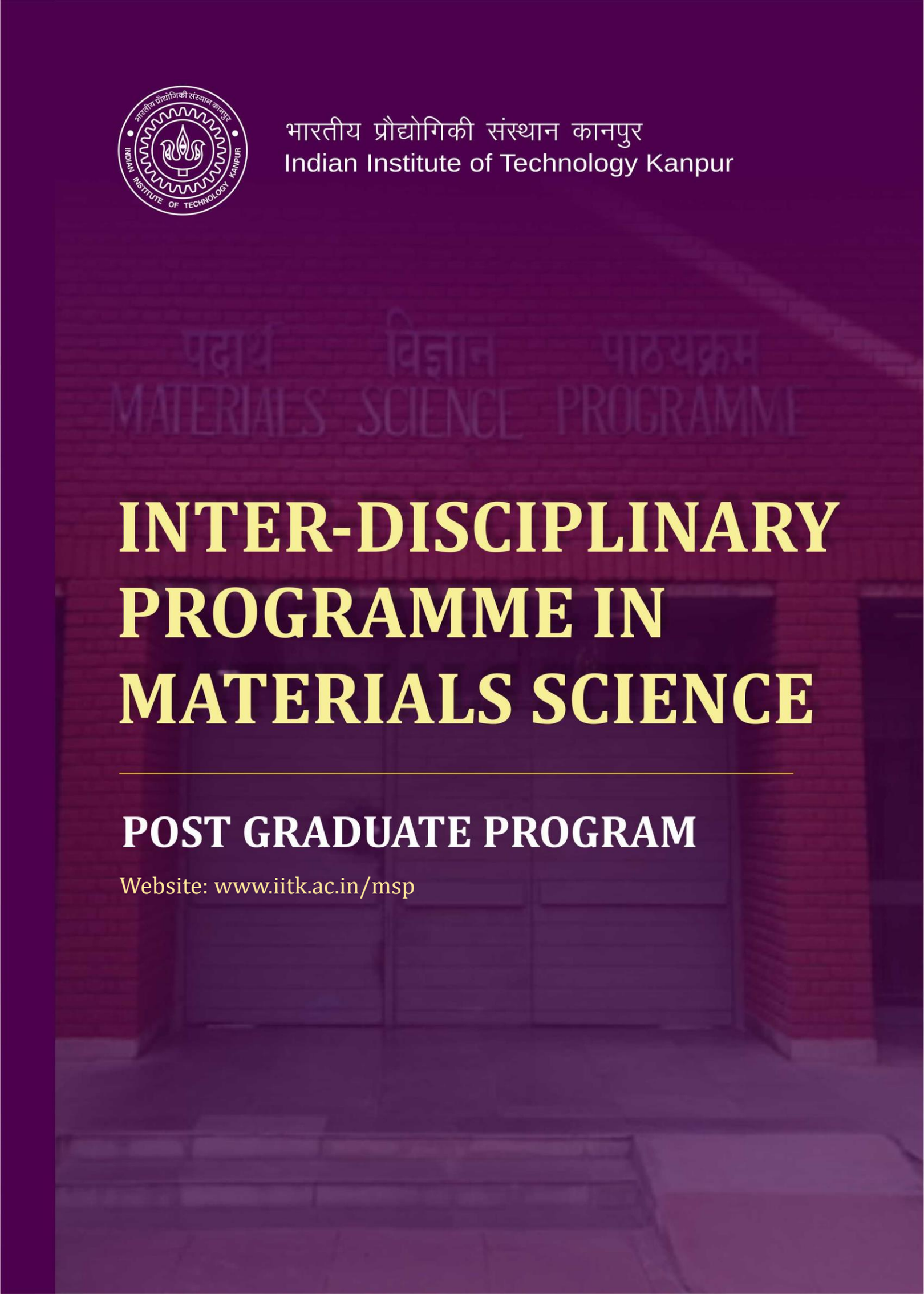
भारतीय प्रौद्योगिकी संस्थान कानपुर
Indian Institute of Technology Kanpur



INTER-DISCIPLINARY PROGRAMME IN MATERIALS SCIENCE

POST GRADUATE PROGRAM

Website: www.iitk.ac.in/msp

INTER-DISCIPLINARY PROGRAMME IN MATERIALS SCIENCE

"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 interdisciplinarity, 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 technical troubleshooting environment.

POST-GRADUATE PROGRAMMES OFFERED

Ph. D. in Materials Science Programme

M. Tech/ M.E. background students have to complete 04 courses (36 credits) to complete course work and minimum 72 Thesis credits

B.Tech./B.E./BS (4 year programme)/ M.Sc. Background students have to complete 10 courses (90 credits) in which 05 compulsory courses of department & rest open elective courses to complete course work and minimum 72 Thesis credits

Minimum total credits for Ph.D. programme is 144 & 216 respectively for above points

List of compulsory Courses for B.Tech./BS-MS/MS/M. Sc. Background Students (Optional for M. Tech. Background students)

- MS-601: Structural & Magnetic Properties of Materials
- MS-602: Electrical & Dielectric Properties of Materials
- MS-603: Mechanical Properties of Materials
- MS-604: Characterization of Materials
- MS-605: Materials Engineering
- MS-888: Introduction to Profession and Comm. Skills for Materials Scientists
- MS-698: Graduate Seminar
- MS-799: Ph. D. Thesis

Arrange of elective courses (in addition of above core courses Minimum 05 course of minimum 09 credits)

Additionally, student is also supposed to submit and defend a research thesis for successful completion of the program

POST-GRADUATE PROGRAMMES OFFERED

M.Tech. in Materials Science Programme

07 Courses (63 credits) in which 05 compulsory courses of department and 02 elective courses with minimum 63 thesis credits

Minimum total credits for M. Tech. programme is 144

Minimum duration for M. Tech. programme is 04 semester and maximum duration of M. Tech. programme is 04 years

List of compulsory Courses

- MS-601: Structural & Magnetic Properties of Materials
- MS-602: Electrical & Dielectric Properties of Materials
- MS-603: Mechanical Properties of Materials
- MS-604: Characterization of Materials
- MS-605: Materials Engineering
- MS-888: Introduction to Profession and Comm. Skills for Materials Scientists
- MS-698: Graduate Seminar
- MS-699: M. Tech. Thesis

Arrange of elective courses (Minimum 02 courses of minimum 09 credits)

Additionally, student is also supposed to submit and defend a research thesis for successful completion of the program.

LABS/FACILITIES

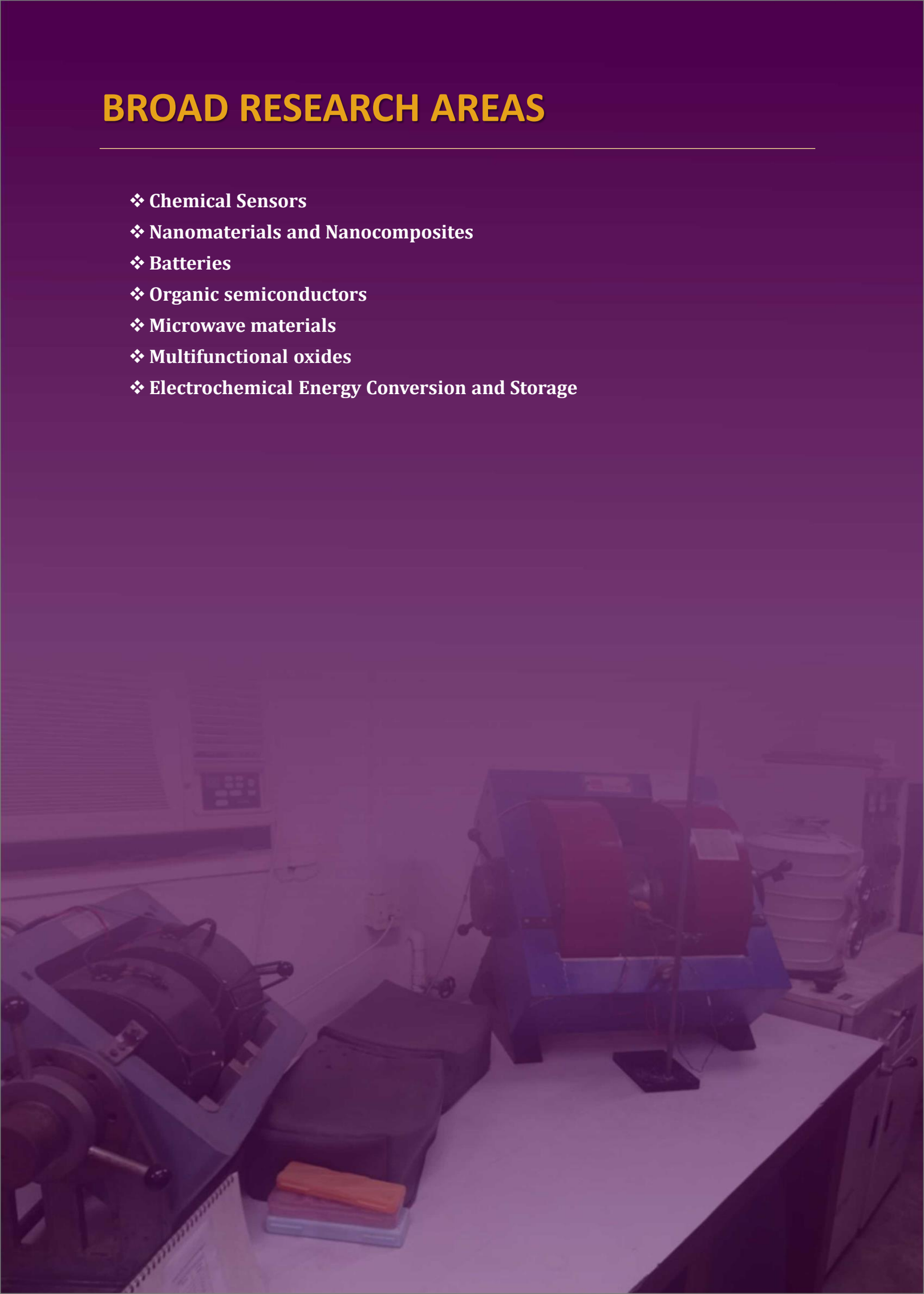
- Optical and Functional Oxides Lab
- Electrical Characterization Lab
- Advance Nano Engg. Materials Lab
- Semi Conductor Laboratory
- Microwave Materials Processing Lab
- Energy Storage Material Lab
- Electrochemical Energy Conversion Lab

FACULTY LIST

- Jaleel Akhtar, PhD (University of Magdeburg, Germany): Microwave Material Processing; Microwave Imaging and Non-Destructive Testing; Electromagnetic Characterization of Artificial Dielectrics, Nano-Composites and Metamaterials; Microwave Material Interaction and Multiphysics Modeling; Design of Microwave Devices Using Electromagnetic Inverse Scattering.
- Rajeev Gupta, PhD (IISc Bangalore): Probing Structure-property correlations in Materials, Multiferroics and Nanomaterials, Phase Transitions in Materials, Alternate Battery Materials, Biomaterials, Nanotubes and Nanowires, Properties of Materials under Pressure.
- Kamal K. Kar, PhD (IIT-Kharagpur): Carbon Nanotubes, Nanostructured Materials, Nanopolymer, Nanocomposites, Multifunctional and Functionally Graded Composites, Biomaterials, Carbon-Carbon Composites, Analysis and Applications in Field emission Devices, Solar Cell, Fuel Cell, High Energy Density Battery, High Performance Structural Composites.
- Y. N. Mohapatra, PhD (IISc Bangalore): Electronic and Optoelectronic Materials, Physics of Semiconductor Devices and Defects, Organic Semiconductors, Polymer Light-emitting Diodes and Photo-electronic Applications.
- Raj Pala, PhD (University of Utah): Electrochemical-,reaction engineering and Separations Engineering, Sustainable energy and environment, Plasmaelectrochemical and Magnetoelectrochemical systems, Solid-state batteries, Electrochemical CO2 conversion, Electrochemical Taste-Sensors and synthesis of super-energetic hydrides.
- Siddhartha Panda, PhD (University of Houston): Chemical Sensors, Micro/Nano Fabrication, Microfluidics, Electronic Materials Processing, Plasma Processing.
- Sri Sivakumar, PhD (University of Victoria): Synthesis and Characterization of Nanomaterials, Layer-by-Layer (LbL) Assembly, Polymer Capsules, Thin Films, Drug Delivery, Photonic Crystals.
- Yogesh M Joshi, PhD (IIT Bombay, National Chemical Laboratory Pune): Structure and dynamics of Colloidal Glasses and Gels, Soft Matter, Rheology of Complex Fluids, Polymer Science and Engineering, Polymer Nanocomposites.
- Ashutosh Sharma, PhD. (State University of New York at Buffalo): Soft nanofabrication, Mechanics, patterns and instabilities of soft visco-elastic interfaces and ultrathin films, Self-organized meso-patterning of polymers, carbon, ceramics and hydrogels, Functional and nano-materials: adhesive, catalytic, optical, super-wetting and nano-composites, Multiscale MEMS/NEMS & microfluidic systems: materials and platforms, Soft interfaces: Wetting, adhesion and friction, Carbon micro/nanostructures & composites: fabrication and applications in environment, health and energy; bio-platforms; electrochemical systems, Interfacial and colloidal interactions.
- Pritam Chakraborty, PhD. (The Ohio State University, Columbus): Solid Mechanics; Non-linear deformation; Plasticity; Crystal Plasticity; Fracture; Fatigue; Creep; Finite Element Method; Multi-scale Method.
- Amit Verma, PhD. (University of Notre Dame, IN, USA): Materials Growth for semiconductor device fabrication, characterization and modeling.

BROAD RESEARCH AREAS

- ❖ Chemical Sensors
- ❖ Nanomaterials and Nanocomposites
- ❖ Batteries
- ❖ Organic semiconductors
- ❖ Microwave materials
- ❖ Multifunctional oxides
- ❖ Electrochemical Energy Conversion and Storage



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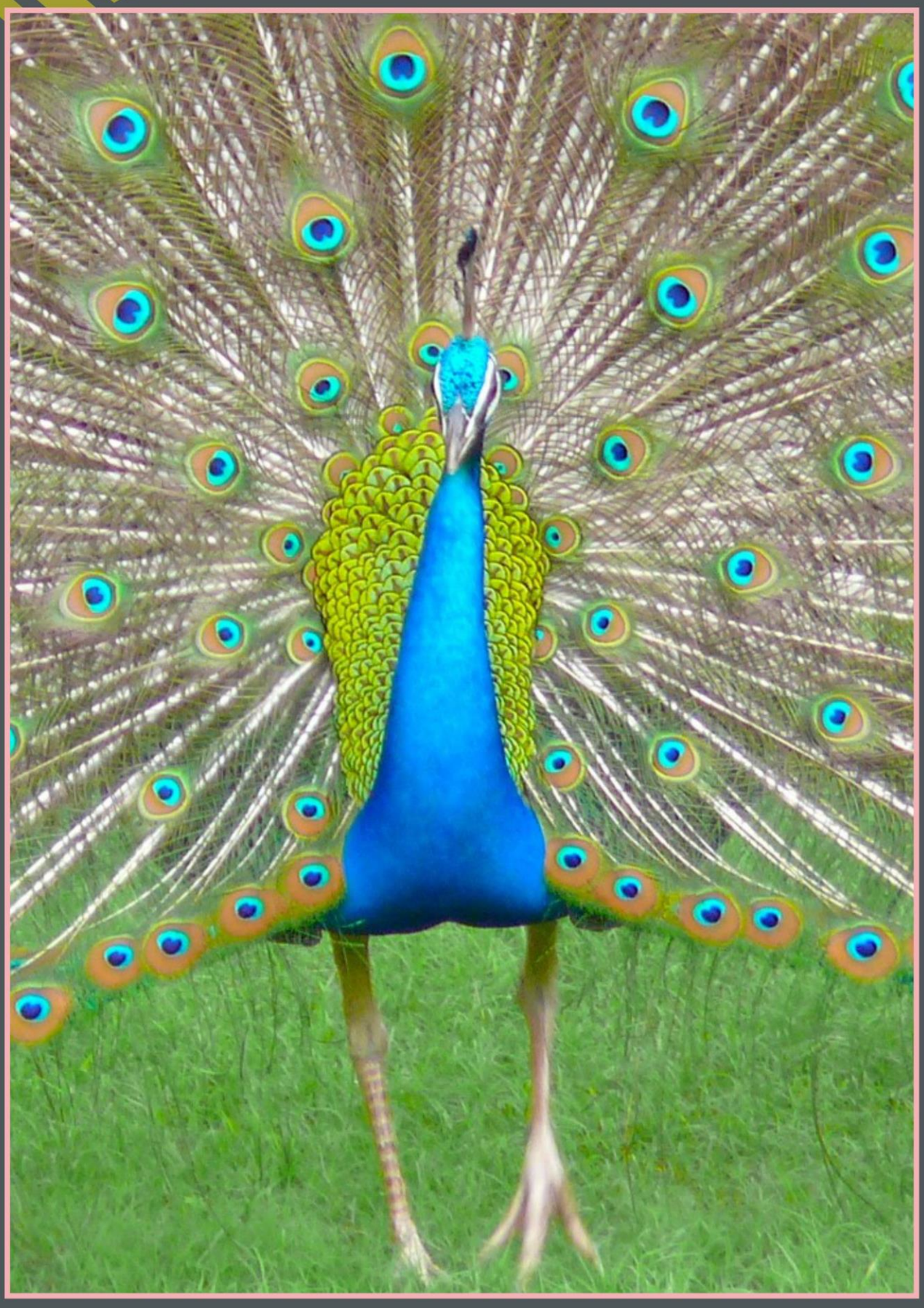

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