

Department of Sustainable Energy Engineering

Indian Institute of Technology, Kanpur

PLACEMENT BROCHURE STUDENT PLACEMENT OFFICE



2022-2023



<https://www.iitk.ac.in/see>



https://twitter.com/iit_see



<https://www.linkedin.com/company/department-of-sustainable-energy-engineering-iit-kanpur/>



LIST OF CONTENT

- 1. Welcome message from the HOD**
- 2. About Us**
- 3. Broad Research Areas of the Department**
- 4. Student Demographics**
- 5. Academic Curriculum**
- 6. Lab facilities**
- 7. Ongoing projects**
- 8. Collaborations**
- 9. Faculty List and Expertise**
- 10. Contact Us**



WELCOME MESSAGE FROM THE HOD



Prof. Ashish Garg

**Head, Department of Sustainable Energy
Engineering**

On behalf of the Department of Sustainable Energy Engineering at IIT Kanpur (IITK), I welcome you for the placement session of our institute in this year. I am confident that you will be employing the very best from the talent pool available in our country and IITK is a coveted place for such purpose.

The institute is celebrating its diamond jubilee this year and in its journey, it has undertaken several path-breaking educational and R&D initiatives since its inception that have been imbibed by several institutes across the country. IITK takes immense pride in providing all rounded development to its students by blending academic and research rigour with several extra-curricular activities. The institute provides science based engineering education to its students while inculcating human values and progressiveness in their minds.

I am sure that the first postgraduate batch of Sustainable Energy Engineering is vibrant, bright, motivated and is ready to undertake the challenges posed by the industry. The department has provided its students rigorous training not only in theoretical and analytical skills but also a hands-on experience through unique laboratory courses. We believe our students are responsible, aware and are willing to work towards tackling the national and global energy, environment and climate issues that we face today.

The Student Placement Office (SPO) of our institute strives to provide an interactive platform to facilitate fruitful interactions between our students and the potential employers. Our emphasis is on providing an open atmosphere which can establish the connect to allow synergy between the goals, objectives, and aspirations of all the stakeholders. We fully appreciate the vital role of human resources in an organizational eco-system and are sure that you will be able to find the most suitable candidates. We are confident that our students will prove valuable to your organization and will further the objectives of your organization.

Although this will be our first batch to graduate, our endeavour has been to train our students along the excellent ethos of IITK. I am sure you will be satisfied and that they will be suited to become your future employees. I am confident that they will shine in your respective organizations, in turn, providing us the necessary strength to continue our journey of achieving excellence in human resources development.

Again, we welcome you to IIT Kanpur and wish you a pleasant experience!

Best wishes,

ASHISH GARG

Professor and Head

**Department of Sustainable Energy Engineering
Indian Institute of Technology Kanpur**

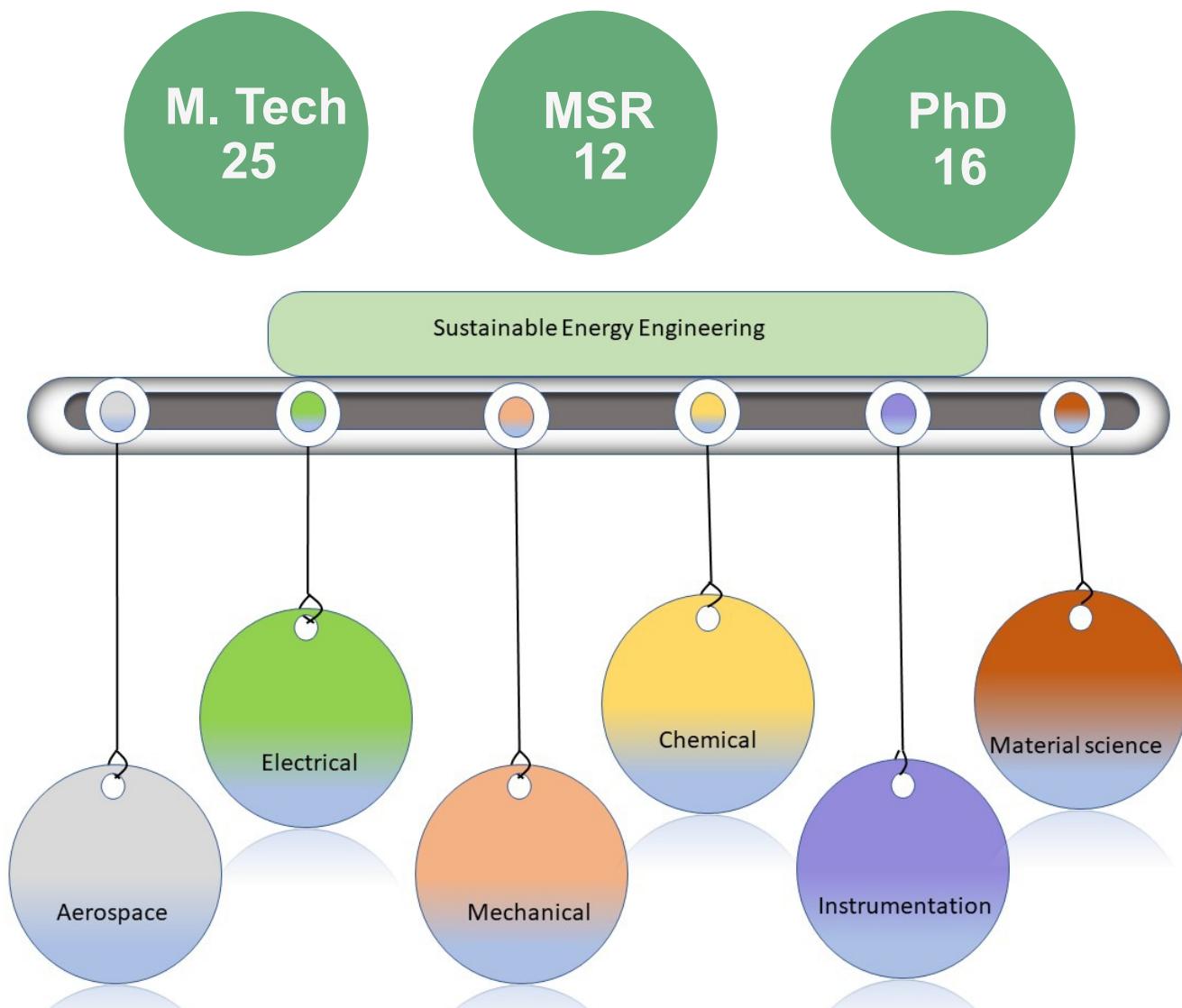
ABOUT US

For societal development and for maintaining the quality of life of citizens of India as well as the rest of the world, energy sustainability is a vital concern. The energy needs of the society need to be met in such a manner that the energy production has a minimal environmental impact and a low carbon footprint.

The indigenous development of novel alternative and renewable energy technologies necessitates the development of R&D infrastructure as well as highly qualified human resources through focused academic programs.

By keeping this in mind IIT Kanpur has initiated new department Sustainable Energy Engineering with the collaboration of different departments such as Mechanical, Electrical, Aerospace, Chemical, Material Science and instrumentation which is first in India. The Department of Sustainable Energy Engineering or SEE (www.iitk.ac.in/see) addresses these challenges by imparting high-quality education and training to its students in various aspects of energy sustainability via vibrant postgraduate programs.

2022-2023 BATCH

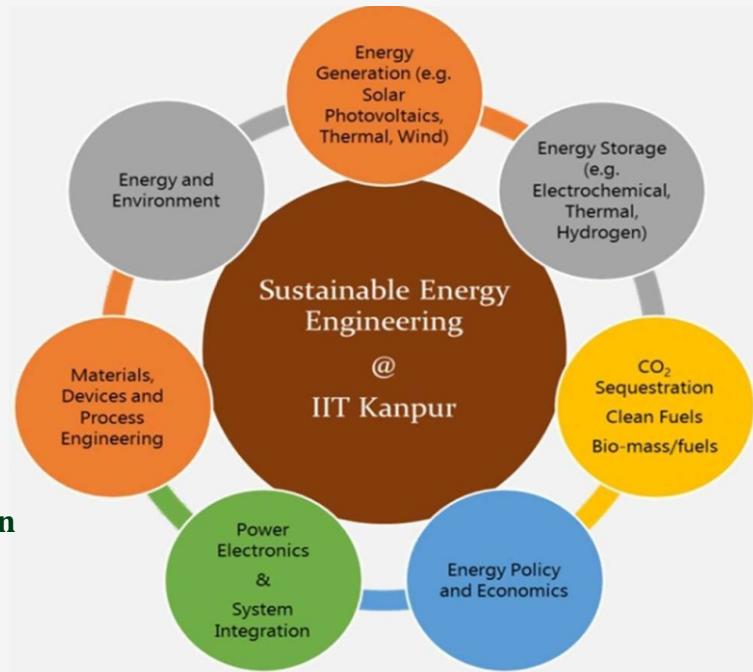


BROAD RESEARCH AREAS OF THE DEPARTMENT



Department of
Sustainable Energy
Engineering

- Solar Photovoltaics
- Solar Thermal
- Wind Energy
- Batteries and Supercapacitors
- Fuel Cells
- Electric Vehicles
- Hydrogen and alternative fuels
- Carbon Capture and Utilization
- Water
- Smart Grid and Renewables Integration
- Energy Economics, Policy and Regulation
- Building design
- Energy Efficiency
- NetZero and Carbon Neutrality



STUDENT DEMOGRAPHICS

M.Tech.

M.S. (by Research)

Ph.D.

The detailed admission procedure along with the eligibility criteria can be found at:

- (I) www.iitk.ac.in/doaa/admission-procedure
- (ii) <https://iitk.ac.in/doaa/data/pgmanual-02Sep2015.pdf>

ACADEMIC COURSES OFFERED

- Thermo-Fluid Engineering
- Physics of Energy Materials
- Basic Electrical Engineering
- Thermodynamics of Energy Systems
- Introduction to Sustainable Energy Systems and Technologies (with Laboratory)
- Electrochemical Energy Systems
- Hydrogen Energy: Production, Storage and Utilization
- Bioenergy
- Computational Methods in Engineering
- Introduction to Materials Modelling and Simulations
- Energy Systems: Process Analysis and Modelling
- Manufacturing of energy systems
- Solar Photovoltaics
- Introduction to Sustainable Energy Policy
- Smart Grid Technology
- Simulations of Power Systems
- Basics of Power Electronic Converters
- Advanced Power System Stability
- Fundamentals and Applications of Electrochemistry
- Numerical Methods
- Applied Numerical Methods
- Introduction to Scientific Computing
- Molecular Simulations
- Practical Introduction to Quantum Mechanical Methods for Scientists and Engineers
- Fuel Cells
- Wind Energy
- Solar Thermal Engineering
- Essential Electrical Engineering for Renewables Integration

RELEVANT COURSES

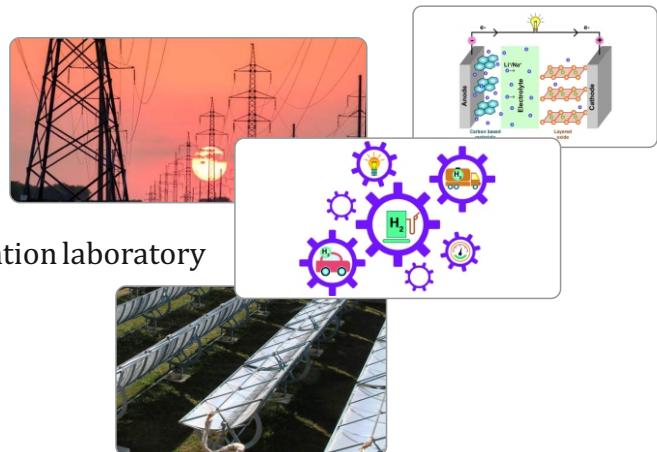
- Smart Grid Technology Application
- Numerical simulation of fluid flow through porous media
- Instrumentation, Measurements And Experiments In Fluids
- Introduction to molecular simulations
- Energy Storage Systems
- Productivity And Efficiency Analysis: Theory And Benchmarking Applications
- Project Financing
- Energy and Carbon Markets: Economics, Policy and Regulation
- Renewable Energy - Economics, Policy and Regulation
- Power Sector Reform & Reform and Regulation
- Science and Technology of Thin Films and Device Fabrication
- Introduction to Scientific Computing
- Mathematics for Aerospace Engg.

LABS/FACILITIES

TEACHING LABORATORY:

Sustainable Energy Technologies lab consisting of experiments related to student training on solar photovoltaics, solar thermal, storage, hydrogen and fuel cells, smart grid, wind energy, basic electronics, temperature and flow measurements, Materials synthesis and characterization.

The Department is interdisciplinary and newly established it gives access to different labs and resources present at IIT Kanpur based on research projects.



KEY RESEARCH LABORATORIES:

- Solar photovoltaics fabrication laboratory
- Battery materials and cell development and characterization laboratory
- Hydrogen generation and storage laboratories
- Smart grid facilities
- Solar thermal storage
- Wind Tunnel facilities

OTHER LAB FACILITIES :

- Solid state diffusion lab
- Energy Storage Lab
- Hydrogen Energy System Lab
- Low Speed Unsteady Aerodynamics Lab
- PERI lab
- Helicopter lab
- Computational propulsion lab
- Combustion and Acoustic Lab

INSTITUTE FACILITIES



Advanced Center for Materials Science

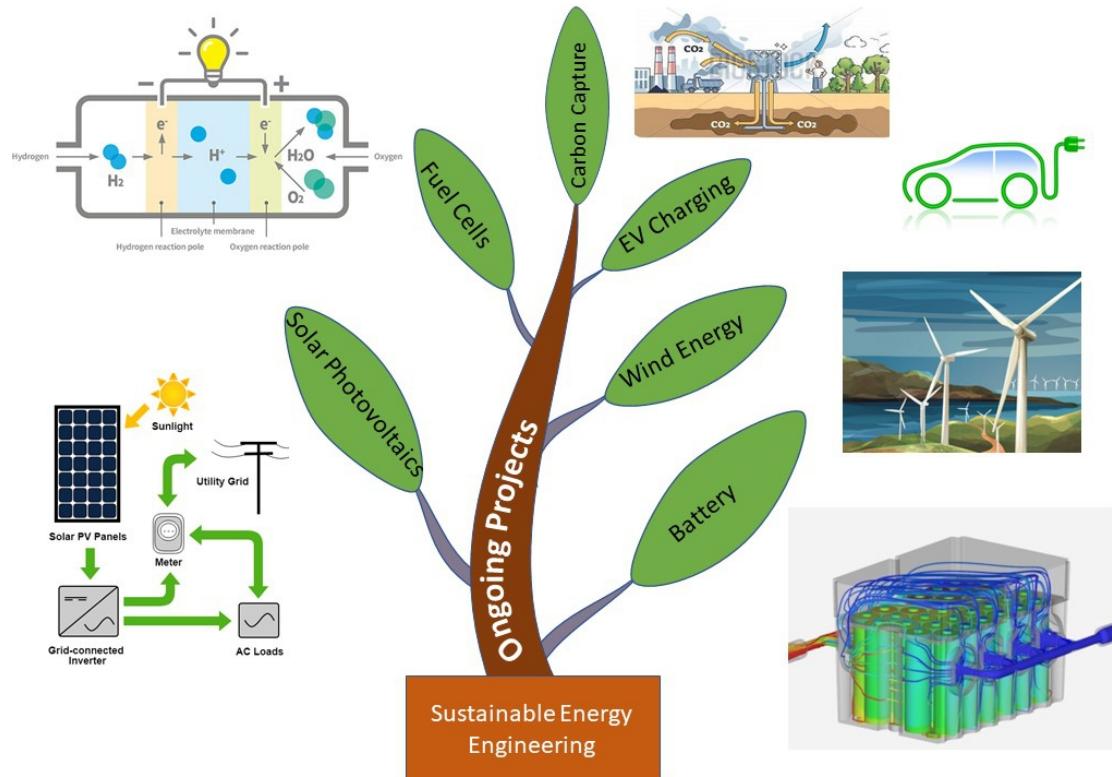


Advanced Imaging Center



Nanoscience Center

ONGOING PROJECTS



Battery Storage

- ❑ Trade off temperature in refrigerant-based battery thermal management for input power optimization
- ❑ Hybrid Battery Thermal Management System
- ❑ Solid state battery material Design aided by computational methods
- ❑ Advanced Battery thermal Management System for EV
- ❑ Mitigation of Thermal Runaway through effective Battery Thermal Management System
- ❑ Energy Storage using Microchannel Adsorption System
- ❑ Battery Thermal Management for the Fast Charging
- ❑ Aluminium Sulphur battery
- ❑ Macroscopic modeling of the discharge behavior of sodium air flow battery

Solar Energy & Hydrogen Energy

- ❑ Thermal management of PV panel
- ❑ Developing Silver and alternative to silver paste for solar photovoltaic cell
- ❑ Design and Installation of High flux Solar Simulator
- ❑ Enhancing Operational Stability of Perovskite Solar Cells
- ❑ Use of lead-free Double perovskite for Perovskite solar cells
- ❑ Energy Storage using Microchannel Adsorption System.
- ❑ Solid state hydrogen storage
- ❑ Refrigeration based on Hydrogen storage

Carbon Capture & EV charging

- ❑ Adsorption of CO₂ using Mxenes
- ❑ Theoretical aspect of carbon dioxide conversion with focus on catalyst.
- ❑ Solar Methane Reforming
- ❑ Micro inverter
- ❑ Resiliency and self healing in Power distribution system (Smart grid)
- ❑ Multi-port converter for Electric vehicle charging
- ❑ Digital twin technology for Electric Vehicle

Wind Energy

- ❑ Vehicle Mounted Wind Turbine
- ❑ Vortex bladeless wind turbines
- ❑ Variable pitch vertical axis wind turbine
- ❑ Flapping Wing Energy Harvesting
- ❑ Data driven wind wake model for wind farm with help of machine learning
- ❑ Study and improving the performance of Hydrokinetic Turbines
- ❑ Usage of tubercles in horizontal axis turbines, and its effect in annual energy production

Energy Policy and Machine Learning

- ❑ Energy demand forecasting for building uses machine learning approach
- ❑ Clean energy transition
- ❑ Selection of optimal solar plant location
- ❑ Demand forecast of coal in India
- ❑ Tropical cyclone track forecasting based on time series data
- ❑ Forecasting electricity demand and supply for Uttarpradesh
- ❑ Wind-Solar hybrid plan compatibility in India

COLLABORATIONS

RICE-IITK COLLABORATIVE CENTER

Rice-IITK Collaborative center is first of its kind where Rice, a top US university, has established a physical center with a top Indian institute. It is envisaged that the Center fosters a thriving research for the development of long-term solutions to meet the ever-increasing global energy demand. Both the institutes being at the forefront of cutting-edge research in energy solutions, this Research Center facilitates deeper levels of collaborations, exchange of knowledge and perspectives, that fertilizes ground-breaking ideas between the faculty members and researchers creating a conducive environment for both the institutes to undertake grand challenges in the area of sustainable energy and environment.



CHANDRAKANTA KESAVAN CENTER FOR ENERGY POLICY AND CLIMATE SOLUTIONS

CHANDRAKANTA KESAVAN CENTER
FOR ENERGY POLICY & CLIMATE SOLUTIONS | IIT KANPUR



The Center spearheads IIT Kanpur's commitment to being carbon neutral. This allows IIT Kanpur to be showcase testbed for transition to a low and eventually zero carbon campus. This entails studies related to in-campus electricity consumption, conservation and management (primarily for lighting and cooling), mobility or transportation, water and waste recycling, followed by policy intervention and implementation. This activity yields several projects that are undertaken by undergraduate and graduate students.

IIT KANPUR-LA TROBE UNIVERSITY RESEARCH ACADEMY



IIT Kanpur and La Trobe University have jointly setup a "Research Academy" to create a globally recognised Centre of Excellence initially focusing on Smart City Solutions.

Its mission is to foster a long-term collaboration that reflects a common research purpose which leads to collaborative research, joint training and scholarship support for doctoral students jointly enrolled at both institutions. Working with industry and other stakeholders in India and Australia, the Research Academy will facilitate the translation of research into practice and enable the commercialisation of Intellectual Property.

FACULTY LIST AND EXPERTISE

Prof. Aakash Rai

Expertise: Smart building design, Thermal analysis

Prof. Abheejeet Mohapatra

Expertise: Power system security, Uncertainty modelling

Prof. Abhishek

Expertise: Wind Energy, Rotary Wing Aeromechanics

Prof. Anand Singh

Expertise: Energy materials development

Prof. Anandh Subramaniam

Expertise: Nanocrystals and Nanostructures

Prof. Ankush Sharma

Expertise: Power Systems, Smart Grid Technology

Prof. Anoop Singh

Expertise: Energy economics

Prof. Ashish Garg

Expertise: Perovskite and organic solar cell materials and device development, Battery Materials

Prof. Ashoke De

Expertise: Energy Harvesting, Wind & Hydro Energy, Modelling

Prof. Debopam Das

Expertise: Wind energy

Prof. Deepika Swami

Expertise: Energy Policy and Climate Change

Prof. Goutam Deo

Expertise: Catalysis, Carbon capture

Prof. Himanshu Sharma

Expertise: Carbon capture, alternative fuels

Prof. Jayant K. Singh

Expertise: Materials design, Computational Materials

Prof. Jishnu Bhattacharya

Expertise: Storage materials development, modelling

Prof. Kanwar Singh Nalwa

Expertise: Solar cells (Device physics, Materials, Characterization), Energy storage materials and devices (Na-ion and Liquid metal batteries)

Prof. Lalit M. Pant

Expertise: Electrochemical energy conversion and storage, numerical modelling, porous media transport

Prof. Laltu Chandra

Expertise: Heat Transfer and Fluid Flow, Computation and Experiment, Turbulent Flow Simulation and Modelling, Solar Thermal Sub-system Design, Nuclear Reactor Thermal Hydraulics

Prof. Malay K. Das

Expertise: CH₄ Recovery from gas hydrate, CO₂ sequestration, Electrochemical Energy Conversion and Storage

Prof. Nishith Verma

Expertise: Adsorption, Synthesis of nanomaterials including adsorbents and catalysts, Environmental Pollution Control (air/water purifications), Carbon-based Electrodes

Dr. Parthasarathi Sensarma

Expertise: Power Electronics for Renewable Generation

Prof. Pradip Swarnakar

Expertise: Environmental Sociology, Climate Change Policy

Prof. Raja Angamuthu

Expertise: Storage materials development

Prof. Raju Kumar Gupta

Expertise: Storage materials and devices, Solar energy materials and devices, Water Remediation, Hydrogen production, Carbon Capture and Conversion

Prof. Saikat Chakrabarti

Expertise: Smart grid, Microgrid, Power system dynamics and stability

Prof. Sameer Khandekar

Expertise: Phase-change heat transfer, Heat pipes, Electronics thermal management, energy systems

Prof. Shobhit Omar

Expertise: Storage and fuel-cells materials and devices development

Prof. Suvendu Samanta

Expertise: Power Electronics, Electric Vehicles, Wireless Power Transfer, Resonant Converters with WBG Devices

Prof. Vaibhav Arghode

Expertise: Solar Thermal Energy

Prof. Vishal Agarwal

Expertise: Computational Catalysis, Biofuels and CO₂ conversion

FACULTY TO JOIN SOON

- **Prof. Prabodh Bajpayee** (Expertise: Smart grid, power systems)
- **Prof. Rajeev Jindal** (Expertise: Solar photovoltaics, batteries, energy policy)



STUDENTS' PLACEMENT OFFICE

109, Outreach Building, IIT Kanpur

Phone : +91 512 2594433/34
Email : spo@iitk.ac.in

CONTACT US



Dr. Rajeev Jindal
Student Placement Advisor
SEE Department
rajeevj@iitk.ac.in
Phone : 0512 679 2323



Mr. Gosu Satish Kumar Reddy
Department Placement Coordinator
MSR
skreddy21@iitk.ac.in
Phone: +91 7996998373



Mr. Mohammad Hashim
Department Placement Coordinator
M.Tech
mhashim21@iitk.ac.in
Phone: +91 8750687660

Webpage: <https://www.iitk.ac.in/see/pg-programme.php>