POST GRADUATE PROGRAM

2023-2024

CONTACT

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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. 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.

The research portfolio of the Department is envisioned into four broad verticals: (i) Energy Generation, (ii) Energy Storage, Distribution and Usage, (iii) Alternative Fuels, and (iv) Energy, Environment, & Policy which align well with the national and global domains in energy sustainability. The research areas in these verticals can be seen in the illustration shown below.

**ILLUSTRATION: RESEARCH VERTICALS OF THE DEPARTMENT AND THE TOPICS THEREIN**

**Energy Generation**
- Solar Energy
- Wind Energy
- Fuel Cells
- Hydro Energy
- Geothermal Energy
- Other new forms

**Energy Storage and distribution**
- Batteries and Supercapacitors
- Electrical mobility
- Hydrogen storage
- Solar thermal
- Power distribution
- Smart grid

**Alternative Fuels**
- Hydrogen
- Methanol and ethanol
- Bio-energy
- Waste-to-energy
- Clean fuels
- New Paradigms

**Energy, Environment and Policy**
- Energy and water
- Carbon capture
- Energy policies and economics
- Energy conversation
- Smart buildings

The Department will place special emphasis on (i) solar energy conversion and storage via photovoltaics and thermal methods for energy generation, (ii) contemporary and novel battery, fuel-cell and supercapacitor materials, devices and architectures, prototypes and system development for electric vehicles, (iii) smart grid and power distribution, (iv) hydrogen as a clean fuel with emphasis on production and storage, (v) carbon capture and (vi) clean water. The faculty of the department have core strengths in science and engineering whose research domains are in various aspects of sustainable energy engineering. The aim of the academic programmes will be on developing engineers who will be able to connect the fundamental nuances of science and engineering of energy sustainability with energy systems development. The department also aims to embark on making meaningful international collaborations to benefit its students. In this direction, it already has strong linkages with Rice University in the form of Rice-IITK Collaborative Center (www.iitk.ac.in/rice-iitk/) at IITK. Such initiatives are expected to provide the students opportunities for international exposure and collaborations.
POST-GRADUATE PROGRAMMES OFFERED

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

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

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

INSTITUTE FACILITIES

Advanced Center for Materials Science  Advanced Imaging Center  Nanoscience Center
Faculty List and Expertise

Prof. Aakash Chand Rai
Expertise: Energy-efficient Buildings, Impact of Climate Change on Heating and Cooling of Buildings, Indoor Air Quality, Airborne Infection Transmission, and Air Pollution

Prof. Abheejeet Mohapatra
Expertise: Power system security, Uncertainty modelling

Prof. Abhishek
Expertise: Wind Energy, Rotary Wing Aeromechanics

Prof. Amarendra Edpuganti
Expertise: Power electronics applications in renewable energy, electric vehicles, and fuel cell vehicles

Prof. Anand Singh
Expertise: Energy materials development

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

Gururaj Mirle Vishwanath
Renewable penetration challenges to the grid, Machine learning applications to power systems, Power Converters for EV and its interfacing challenges

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  

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

Prof. Parthasarathi Sensarma  
Expertise: Power Electronics for Renewable Generation

Prof. Prabodh Bajpai  
Expertise: Power Electronics for Renewable Generation

Prof. Pradip Swarnakar  
Expertise: Environmental Sociology, Climate Change Policy

Prof. Raja Angamuthu  
Expertise: Storage materials development

Prof. Rajeev Jindal  
Expertise: Energy Technology and Policy, Carbon Neutrality, c-Si Solar Cells and Metal-ion Batteries

Prof. Raju Kumar Gupta  
Expertise: Storage materials and devices, Solar energy materials and devices, Water Remediation, Hydrogen production, Carbon Capture and Conversion

Prof. Sachhida Nand Tripathi  
Expertise: Climate Issues, Climate Modelling, Environment, Air Pollution

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. Sudarshan Narayanan
Solid state batteries (solid electrolytes, anode materials), thin films for energy conversion (transparent conductors, low-emissivity coatings)

Prof. Suvendu Samanta
Expertise: Power Electronics, Electric Vehicles, Wireless Power Transfer, Resonant Converters with WBG Devices

Prof. Swathi Battula

Prof. Vaibhav Arghode
Expertise: Solar Thermal Energy

Prof. Vishal Agarwal
Expertise: Computational Catalysis, Biofuels and CO2 conversion
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
DEPARTMENT OF SUSTAINABLE ENERGY ENGINEERING
Indian Institute of Technology, Kanpur

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