भारतीय प्रौद्योगिकी संस्थान कानपुर
Indian Institute of Technology Kanpur

# Sustainable Energy Engineering

## POST GRADUATE PROGRAM

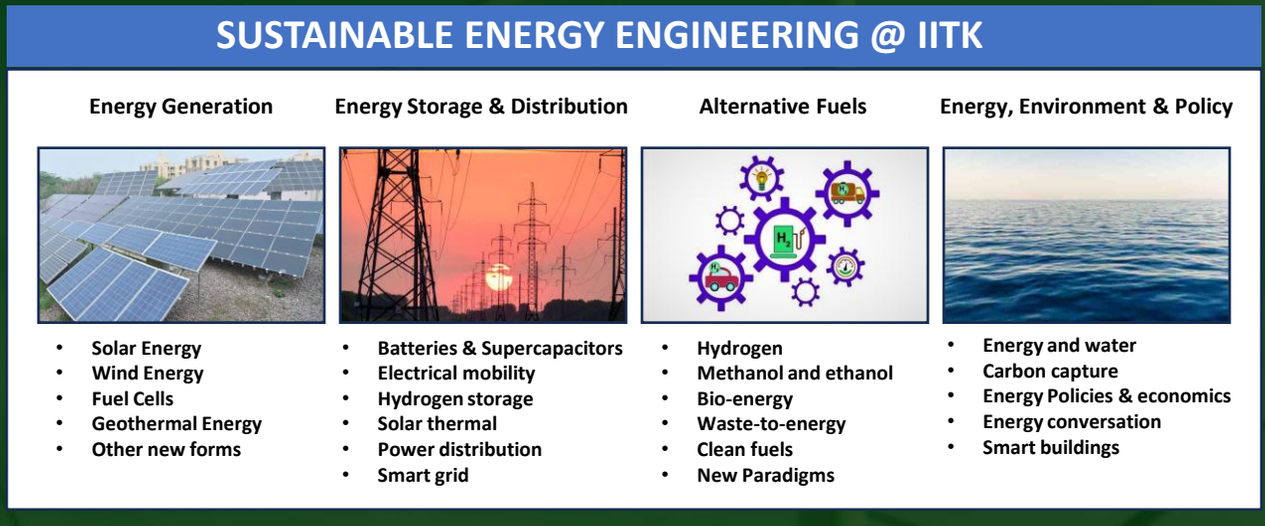
Website: www.iitk.ac.in/see

# SUSTAINABLE ENERGY ENGINEERING

For sustainable development and for maintaining quality of life of citizens of India as well as elsewhere in the world, energy sustainability is a vital concern. We need to understand that our energy needs are met in such a manner so that energy is conserved, managed better and produced using methods that are environmentally benign and have lower carbon footprint. The indigenous development of new, clean, alternative and renewable energy technologies necessitates strong education and R&D base in the country with focused academic programmes to develop competent human resources. The Department of Sustainable Energy Engineering (SEE) will impart high quality education and training to its students in various aspects of energy sustainability via vibrant academic programmes.

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.

Illustration: Research verticals of the Department and the topics therein




The SEE Department will place a 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 has 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 to develop 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 make 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/). IIT Kanpur has Joint Degree Program with various reputed International Universities details are available at: https://www.iitk.ac.in/oir/joint-degree-programs. 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/pg-manual

## Lab Facilities

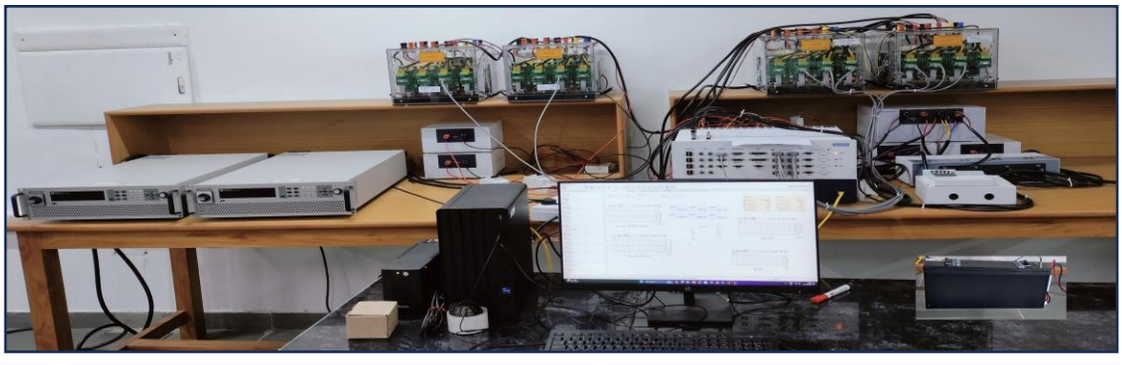
**Teaching Laboratory:**
Sustainable Energy Technologies lab consisting of experiments related to student training on solar photovoltaics, solar thermal, storage, hydrogen and fuel cells, smart grid, wind energy, basic electronics, temperature and flow measurements, Materials synthesis and characterization

**Key research laboratories:**

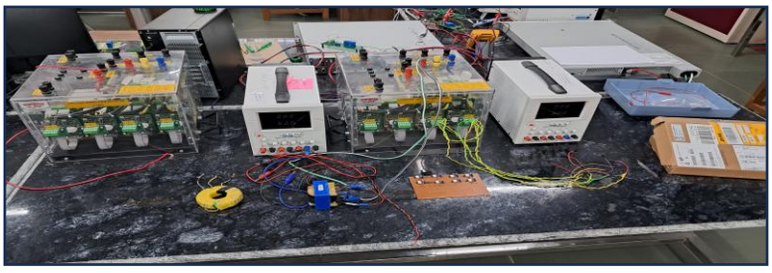
- Solar photovoltaics fabrication laboratory
- Battery materials and cell development and characterization laboratory
- Hydrogen generation and storage laboratories
- sustaiNable pOwer innoVation tEchnoLogies (NOVEL)
- Solar thermal systems

**Institute facilities:**

- Advanced center for materials science
- Advanced imaging center
- Nanoscience center






# FACULTY LIST

## Fulltime and Joint Faculty:

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

**Prof. Ashish Garg**
***Expertise:*** Solar photovoltaic materials and devices: organic, perovskites, and tandem; energy harvesting from ambient sources; recycling of electronic materials, devices and plastics; decarbonization of key industrial sectors.

**Prof. Debopam Das (Jointly with Aerospace Engg.)**
***Expertise:*** Wind energy, Computational Fluid Dynamics, UAVs.

**Prof. Deepika Swami**
**Expertise:** Energy Policy and Climate Change.

**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 Hydaraulics.

**Prof. Prabodh Bajpai**
***Expertise:*** Hybrid AC-DC microgrids, smart grid and renewable integration, solar photovoltaics, electricity markets, power system analysis and control.

**Prof. Rajeev Jindal**
***Expertise:*** Energy Policy, Role of Bio-fuel & Bio-mass in India's energy transition, Energy Transition Modelling, Net Zero Campuses, Net Zero waste technology & behavioural aspects, ESG.

**Prof. Sachhida Nand Tripathi (Jointly with Civil Engg.)**
***Expertise:*** Climate issues, climate modelling, environment, and air pollution.

**Prof. Sheo Shankar Rai**
***Expertise:*** Sustainable Development, Automation and Digital Transformation of Natural Resource Sector, Environment and Social Impact Assessment, Deep Sea Mining for Critical Mineral Resources, Policies and Regulations for Mining and Metal Sector.

**Prof. Soumyabrata Roy**
***Expertise:*** Materials for Energy Transition, Carbon (CO2) Capture and Utilization (CCU), Green Hydrogen & Sustainable Fuels, Heterogeneous Catalysis, Reaction Engineering and Operando Investigations, Energy Devices.

# FACULTY LIST

## Fulltime and Joint Faculty:

**Prof. Srinivas Karthik Yadavalli**
***Expertise:*** Halide perovskites, solar cells (single-junction and tandem), multi-junction photoelectrodes for green hydrogen, and recycling of photovoltaic materials.

**Prof. Sudarshan Narayanan**
***Expertise:*** Solid state batteries (solid electrolytes, anode materials), thin films for energy conversion (transparent conductors, low-emissivity coatings), and advanced characterization.

**Prof. Vaibhav Arghode (Jointly with Aerospace Engg.)**
***Expertise:*** Solar Thermal Energy.

## Adjunct Faculty:

**Prof. Anubha Goel**
***Expertise:*** Characterization of emissions from vehicular exhaust, indoor and ambient air quality assessment, size segregated distribution of particles and organic pollutants on aerosols, health risk assessment, solid waste management, and agricultural impact on climate change.

**Prof. Ashutosh Sharma**
***Expertise:*** Policy matters in science and technology, Battery Materials, Sensors, Nanofabrication, Functional nano-materials, MEMS/NEMS systems, Soft interfaces, Carbon Structures, and Interfacial interactions.

**Prof. Gururaj Mirle Vishwanath**
***Expertise:*** PV and wind integration in power systems, electric vehicle challenges (G to V and V to G), machine learning applications for power systems, ancillary services, microgrids operation and control.

**Prof. Himanshu Sharma**
***Expertise:*** Carbon capture, alternative fuels.

**Prof. Swathi Battula**
***Expertise:*** Electricity Markets, Modelling and Design of Electrical Energy Systems, Transactive Energy System Design, Integrated Transmission and Distribution Systems, Energy Policy and Management.

## Distinguished Visiting Professor:

**Prof. Pulickel M Ajayan**
***Expertise:*** Materials Science, Nanotechnology, Chemistry, Physics.

# FACULTY LIST

## Visiting Professor:

**Prof. Ankur Awadhiya**
***Expertise:*** Natural Resource Management, Climate Change Mitigation, Data-driven Policy Making.

**Prof. Arunavo Mukerjee**
***Expertise:*** The value chain from upstream to the consumer and Spanning both fossil fuels and Renewable sources.

**Prof. Gurudas Nulkar**
***Expertise:*** Circular, Low carbon economy, Socio-ecological aspects of natural disasters, Conservation and livelihoods.

**Prof. Indu Shekhar Chaturvedi**
***Expertise:*** Renewable Energy

**Prof. Navneet Chadha**
***Expertise:*** Circular Economy, Resource Efficiency, Decarbonization, Environmental Management, Enabling Policies, Impact Investments.

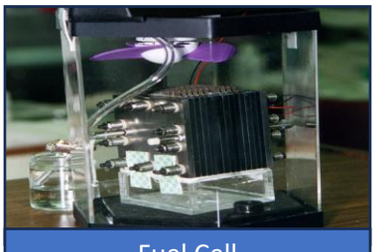
**Prof. Satyam Sahay**
***Expertise:*** Advanced Engineering and Manufacturing Technologies, Analytics and AI/ML Applications, Product Circularity, Sustainability in Metallurgical Processes.

# BROAD RESEARCH AREAS

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

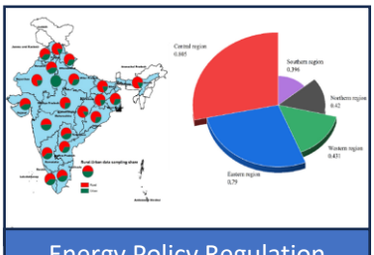

Solar Thermal

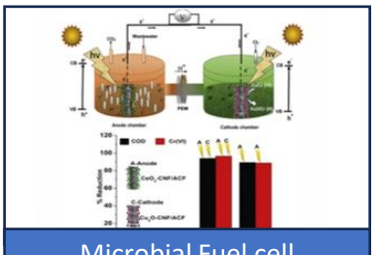

Wind Energy

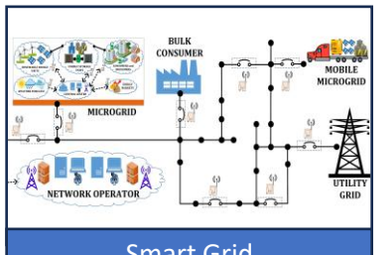

Fuel Cell

Electric Vehicles

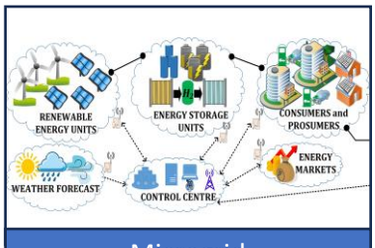

Carbon Capture & Utilization


Energy Policy Regulation


Microbial Fuel cell



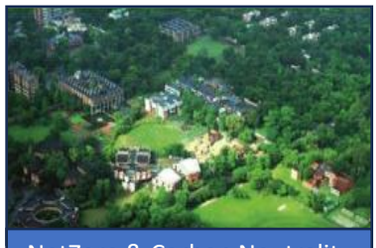
Smart Grid



Microgrid


Solar Photovoltaics


Batteries & Supercapacitors


NetZero & Carbon Neutrality

# CONTACT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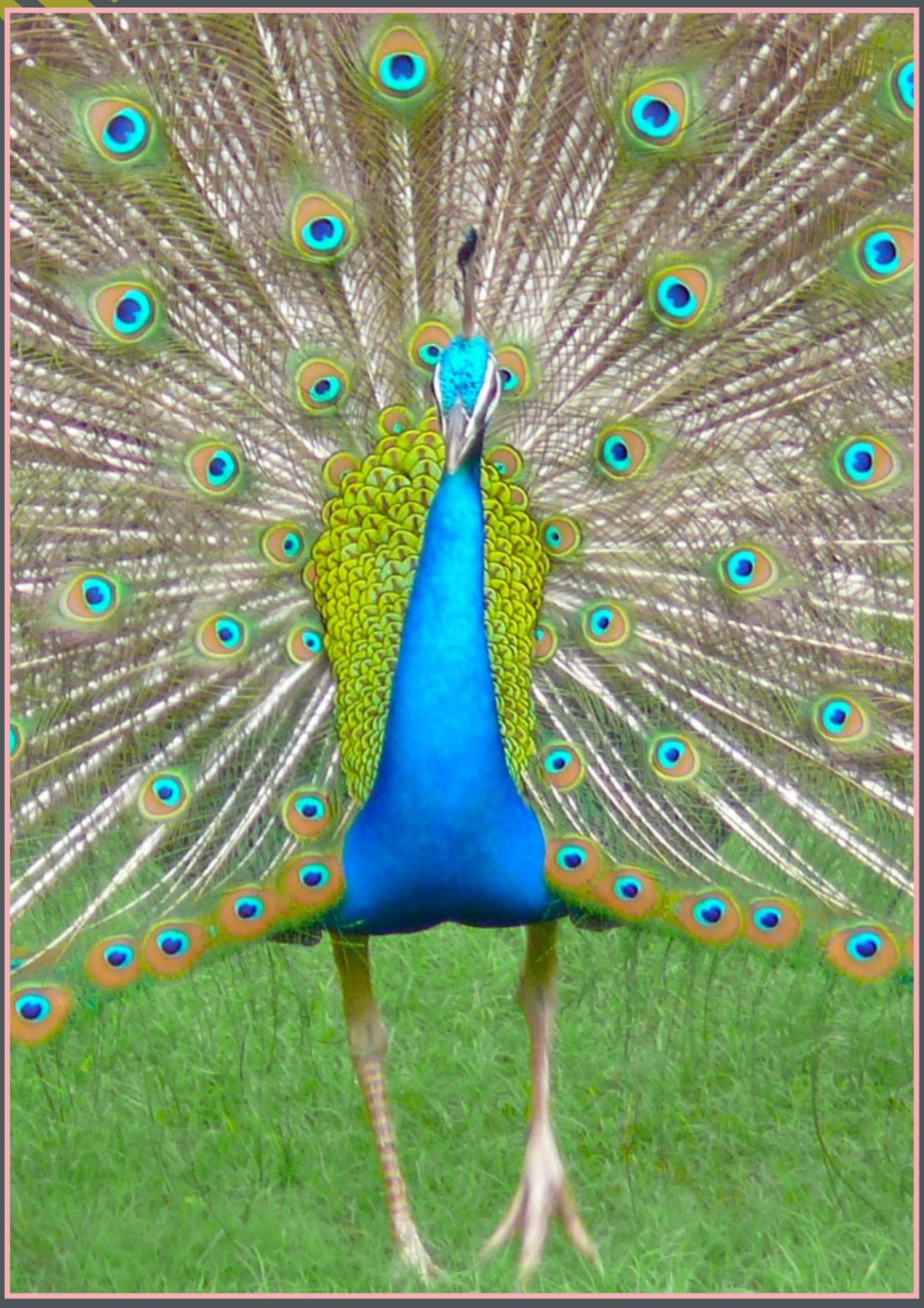
**Phone: 0512-259-2230**


**Webpage: https://www.iitk.ac.in/see/pg-programme**
**List of Courses: https://www.iitk.ac.in/see/List-of-courses**



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