Placement Brochure
2022-23
The Department of Earth Sciences at IIT Kanpur focuses on the study of the Earth, encompassing its evolution and internal dynamics, its surface processes, emphasizing natural and human-induced transformations of the terrestrial environment vis-a-vis sustainable development, given the biggest problem we face in terms of rapidly increasing population.

Objectives

- Integration of quantitative approaches and techniques across various earth systems and applications of geological, geophysical and other related analytical methods. Training Students and developing an aptitude for conjunctive use of field, experimental, analytical and numerical approaches.
- Providing high quality industry and research-oriented manpower in various fields of Earth Sciences.
“The BS-MS and M. Tech. students of the Department of Earth Sciences, IIT Kanpur get thorough academic training that includes course works on fundamental and applied Earth Sciences as well as hands-on training on analytical techniques relevant to our society. Particularly, they learn about natural resources (identification and exploration techniques), Solid Earth geology, Quaternary geology, Sedimentology and Basin analysis, Natural hazards, and Applied geochemistry, etc. Our students are well-trained with the theoretical aspects of hydrocarbon exploration from the basic to advanced stages, theoretical and practical Rock Mechanics, Rock Physics, and different geophysical exploration techniques with laboratory-based components. They visit several exploration industries, their mining sites, and beneficiary plants. In our teaching program, field geology is one of the essential components with emphasis on geological mapping and interpreting geological structures. IIT Kanpur campus environment encourages students to develop as better human beings, leaders, and team members.”

DEBAJYOTI PAUL
Professor and Head
Earth Sciences
ACADEMIC PROGRAMS AND SPECIALIZATIONS

1. Applied Geology
   (Fuels, Engg. Geology, Mineral Exploration, Economic Geology, Hydrogeology)

2. Water and Climate
   (Hydrology, River Science, Climate change, Ecotourism, Atmospheric Science)

3. Applied Geophysics
   (Seismology, Potential fields, Well logging)

4. Solid Earth Geology
   (Deformation, Petrology, Isotope Geochemistry, Geodynamics, Mantle Convection)

5. Natural Hazards
   (Tectonic geomorphology, Flood risk and mitigation, Disaster management)

Applied Earth Sciences: Earth surface processes, Petroleum Geosciences, Climate change, Environmental Geology and Natural Hazards, Emphasis on research

Fundamental and Applied Earth Sciences

Compulsory Courses
- Mathematics for Earth Sciences
- Remote Sensing and GIS for Geo-resource Evaluation
- Geophysical Methods.

Elective Courses
- Aqueous Geochemistry
- River Science
- Isotope Geochemistry and Applications
- Geology and Geochemistry of Petroleum
- Applied Sedimentology and Basin Analysis
- Advanced Structural Geology
- Advanced Metamorphic Petrology
- Applied Hydrogeology
- Instrumentation in Earth Sciences
- Geodynamics
- Mineral Resource Exploration
- Non-Traditional Isotope Geochemistry
- Physics of Earthquakes
- Planetary Geomorphology Processes and Landforms
- Potential field theory in applied geophysics
- Experimental Rock Mechanics & Rock Physics
- Solid Earth Geophysics
- Quaternary Geology and Tectonic Geomorphology
- Rock Magnetism
- Seismic Exploration and Subsurface imaging
- Natural Hazards
- Active Tectonics and Paleoseismology
- Rock Magnetism
Debajyoti Paul, Professor and Head, PhD, Cornell University, USA
(Geochemistry, Mantle Dynamics, Paleoclimate Reconstruction).

Rajiv Sinha, Professor, PhD, University of Cambridge, UK

Javed N. Malik, Professor, PhD, M. S. University of Baroda
(Active Tectonics and Paleoseismology, Geomorphology, Paleo tsunami).

Santanu Misra, Professor, PhD, Jadavpur University, India. (Structural Geology and Tectonics, Experimental Rock Deformation and Rock Physics).

Indra S. Sen, Associate Professor, PhD, Florida International University, USA.
(Radiogenic and Stable Isotope Geochemistry, Non-Traditional Stable Isotopes, Petroleum Exploration with Geochemical Tools, Anthropocene and Deformation Mechanisms & Microstructure of rocks).

Ishwar Kumar C, Assistant Professor, PhD, Indian Institute of Science, 2015.
(Petrology, Tectonics and Crustal evolution, Paleogeography and Continental reconstruction, Remote sensing and GIS applications).
Dibakar Ghosal, Assistant Professor, PhD, IPGP, France
(Exploration Seismology, Poroelastic attribute analysis, Modeling and Inversion, Subduction Tectonics).

Animesh Mandal, Associate Professor, PhD, IIT Kharagpur, India
(Exploration Geophysics, Modeling and Joint inversion, Geophysical data processing/enhancement)

Deepak Dhingra, Associate Professor, PhD, Brown University, USA
(Planetary Vis-NIR Remote Sensing, Lunar Geology, Characterization of Enceladus plume, Impact cratering)

Tajdarul Hassan Syed, Associate Professor, PhD., University of California, Irvine, USA, 2007.
(Global water cycle, water budget, groundwater, glacier mass budget and remote sensing of the environment).

Rabiul Haque Biswas, Assistant Professor, PhD, Physical Research Laboratory, Ahmedabad, India, 2012.
(Quaternary environmental changes, Climate Tectonic and Erosion interactions Quantitative Earth surface processes).

Anupam Bannerjee, Assistant Professor, PhD, Indian Institute of Science Bangalore, India (2018)
(Major and trace elements geochemistry, radiogenic and traditional (C-O-S) and non-traditional (e.g., Ca) stable isotope geochemistry, Silicate weathering, Geochemical Evolution of Earth’s deep interior, Petrogenetic evolution of carbonatite and alkaline melts).
Amar Agarwal, Assistant Professor PhD, IIT-Roorkee and KIT-Germany, 2015 (DAAD Sandwich model) (Applied Structural Geology, Impact Cratering, Rock magnetism).

Bodepalli Govindarao, Assistant Professor PhD, IIT Kharagpur, India, 2019. (Ore Geology, Experimental Sulfide Mineralogy, Mineral/Metal-Microbe Interactions)

Deepa Mele Veedu, Assistant Professor, PhD. Nanyang Technological University, Singapore, 2019. (Earthquake Physics, Earthquake cycle modeling, Laboratory friction experiments).

Hiranya Sahoo, Assistant Professor. PhD, University of New Orleans, USA, 2013 (Sedimentology, Stratigraphy, Paleoclimate, Global Warming, Basin Analysis, Landscape Modelling, Petroleum Geology)
**AWARDS & HONOURS**

Prof. Javed N. Malik Recipient, National Geoscience Award, Ministry of Mines (2016), Fellow of Indian National Science Academy, INSA (2023)

Prof. Rajiv Sinha Elected Fellow, National Academy of Sciences, India (2016)

Prof. Santanu Misra Recipient, Swarna Jayanti Fellowship, DST (2015-16)

Prof. Santanu Misra, has been awarded the prestigious Dr. K.R. Gupta Gold Medal. This award is given by the Council of the Geological Society of India.

Prof Santanu Misra, Department of Earth Sciences has received the "Sera Ajeyo Samman 2017."

Dr. Indra Sen Recipient, Young Scientist Award, Ministry of Mines, Govt. of India (2014)
RESEARCH SCHOLAR DAY 2023

The Research Scholar Day 2023 was a day-long event that brought together researchers, scholars, and students to showcase their work, discuss new ideas and developments, and collaborate on future research projects. The event featured talks from leading researchers in the field of Earth Sciences, as well as poster presentations and interactive sessions that allowed attendees to learn about the latest research and network with their peers.

Chief Guests

Prof. Shyam S. Rai (IISER Pune).

Dr. Joyesh Bagchi - Dy Director - GSI, Lucknow

Oral Presentation Winners

I - Krishnendu Paul, PhD

II - Prabhat Kumar, PhD

III - Shobhit Singh, PhD

Poster Presentation Winners

I - Moumita Akuria, PhD

II - Abhinash Bal, PhD

III - Mishal KT, PhD
Schlumberger activities with the department

- The world's largest oilfield service provider company "Schlumberger" has been associated with Earth Sciences department at IIT Kanpur from 2017.
- Schlumberger day has been celebrated on 3rd - 4th October where technical events like:
  - Case studies
  - Poster presentation etc., were conducted.
- Since then mutual sharing of knowledge between the Institute and the company has been entrenched.

***The department is now looking towards spreading roots and establish a promising relation with major oil and gas companies.
Geophysics projects: Dr. Dibakar Ghosal
- Estimation of petrophysical properties of hydrocarbon bearing reservoirs using FAVO analysis (₹47.00 Lakhs)
- Modelling of Gas hydrate reservoir using integrated techniques (₹66.00 Lakhs)

Structural Geology: Dr. Santanu Misra
- Enhanced Coal-Bed-Methane and Shale-Gas recovery from underground reservoirs aided by permeability enhancement and CO₂ sequestration – an experimental approach. (₹3.17 Crore)
ongoing project

- Drainage reorganization paleoclimate reconstruction and sediment sourcing in the (paleo-) Yamuna plains using a multi-proxy approach. SERB. Debajyoti Paul

- Integrated geophysical study for delineating details subsurface structures and possible mineral deposits around Madawara region, Lalitpur, Uttar Pradesh, India. SERB. Animesh Mandal

- Vanadium isotopes in crude oil and organic rich source rocks: A new paleo redox proxy. DST. Indra Shekhar Sen

- Geochemical and isotopic investigations of tertiary sediments from the NE India understanding the early tectonic uplift and weathering in the Himalayas. SERB. Debajyoti Paul

- Shallow subsurface seismic imaging of the Himalayan foothills near Shillong plateau. IITK. Dibakar Ghosal

- Rheology And Tectono-Metamorphic Evolution Of East Himalayan (Nagaland And Andaman Islands) Ophiolite Sequence And Associated Rocks. IITK. Santanu Misra.

- Dust or soot? Tracing the primary drivers of increased glacial melt of the Himalayan glaciers, PI, DST, Govt. of India. Indra S Sen

- Design and Development of Aquatic Autonomous Observatory (Niracara Swayamsasita VedhShala - NSVS) for In situ Monitoring, Real Time Data Transmission and Web based Visualization, co-PI, Indo-U.S. Science and Technology Forum (IUSSTF). Indra S. Sen.

- To Infer The Sub Ice Geology And Validation Of The Geophysical Data Of Princess Elizabeth Land And Aurora Basin Of Wilkes Land. SERB. Indra S. Sen

- Seismic Studies On Anjar-Mundra Pipeline Project (M/S Gspl). L&T. J. N. Malik

- UAV Data Acquisition And Processing. IIRS. Rajiv Sinha
Research Areas

Hydrocarbon Studies:

- Seismic studies on:
  - Gas hydrate reservoirs
  - Poro-elasticity
  - Refraction Tomography
  - Full Waveform Inversion
- Application and development of new inorganic tools in hydrocarbon exploration

Structural studies:

- Enhanced Coal-Bed-Methane and Shale-Gas recovery from underground reservoirs aided by permeability enhancement and CO2 sequestration – an experimental approach
- Characterization of the frictional properties and seismic-a-seismic transitions in active faults of the Himalaya: an experimental investigation
Geochemical Studies:

- Isotopic evolution of terrestrial reservoirs in open system models of the Earth
- Magnitude and Pathways of Anthropogenic Platinum Group Elements: Emerging Environmental Contaminant in India
- On-Site Detection of Arsenic Fluoride & Hardness in Drinking Water
- Design and Development of Aquatic Autonomous Observatory for In situ Monitoring, Real Time Data Transmission and Web based Visualization
Groundwater Structure and Dynamics

- Geomorphic controls on groundwater aquifers-integrated approach using borehole data and modelling
- Forecasting the response of the groundwater system to plausible future changes in the water cycle
- Modelling groundwater flow dynamics under varying stresses-historical water level data analysis, isotopic methods for source characterization and recharge estimation; groundwater modelling

And also some major studies on:
- Potential field methods
- Integrated geophysical research
- Mineral exploration and near surface studies
- Tectonic studies
- Geophysical data processing/enhancement
- Modeling and joint inversion
Other research areas

Natural Hazards:
- Landslides and slope stability
- River flood risk assessment

Paleo-seismology and Paleo-tsunami study:
- GPS measurement-crustal deformation studies in NW Himalaya
- Paleo-tsunami investigation in Andaman & Nicobar islands

Paleoclimate Reconstruction:
- Paleo climate reconstruction using sedimentary archives

Planetary Studies:
- Aspects related to composition, texture and surface morphology on the Moon and it’s plume Enceladus

River Sciences:
- Human transformations of river system-impact of LULC, anthropogenic interventions and overexploitation on river forms and processes
- Geomorphic features of active tectonics-geomorphic indices, morphometric analysis, Remote sensing and GIS methods

Environmental Sciences:
- Environmental flow and river health assessment

Geochemical Studies:
- Impact of aerosols and Aeolian dust, sea salt spray, soil erosion and volcanic emissions on chemical fluxes on Earth’s surface
- Implication for crustal evolution, heat flow and Open system geochemical evolution models
Research facilities

Geophysics lab
- Well Logger
- Seismic Thumper
- Geophones (RAU)
- High Performance Workstation
- Gravimeter
- Magnetometer
- Very Low Frequency
- VES

Other Useful terrain mapping tools such as
- Total station
- DGPS
- UAV
- GPR

Rock Mechanics Lab
- Rock core Drill Machine
- Vacuum Oven
- Pulveriser
- Low speed diamond Saw
- Automatic Rock curring Polishing
- Uniaxial Rock Machine
- Lathe Machine
- Hydraulic Press
- Hydraulic Hot Mountain Press
- Lapping Machine
Sedimentology & Microscopy

Facilities
- Sedigraph
- XRD
- Sieve shaker
- OSL Reader
- Isodynamic Magnetic separator
- Ultra-Thin Section bench Top
- SEM
- Vibratory Cup mill
- Vacuum Impregnation Unit
- Thin Section Preparation Unit
- UIC coulometer
- Leica Optical Microscope
- Stereo Zoom Microscope (SMZ 1000)
- Cathode Luminescence Microscope

Analytical facilities
- XRF
- Q-ICPMS
- IRMS
- Aerosol Sampler
- Hydraulic Press pellet
- F- AAS
- Core Archival and Analysis Facility
- Core Scanner (DCS)
- Metal- Free clean lab
- Bartington Magnetic Susceptibility Meter- dual Frequency
- Laser Water Isotope Analyzer
- Nutrient Analyzer
Synergy with other Departments

Material Science & Engg.
- Minerals, Material characterization

Mechanical Engineering
- Geomechanics and computational seismology

Humanities
- Environmental Economics, Energy Economics, Econometric methods

Civil Engineering
- Hydrology, Fluid dynamics, River Science, Environment

Mathematics and Statistics
- Data structure, Statistics modeling

IME, Design
- Energy, Innovation

Physics
- Atmospheric Processes, Energy, Fluid flow, Earth's Magnetism

Chemistry
- Physical chemistry, Environmental Chemistry, Biochemistry, Ancient life on earth