

# EARTH SCIENCES

IIT KANPUR



Welcome to Department of Earth Sciences



PLACEMENT BROCHURE  
2022-23

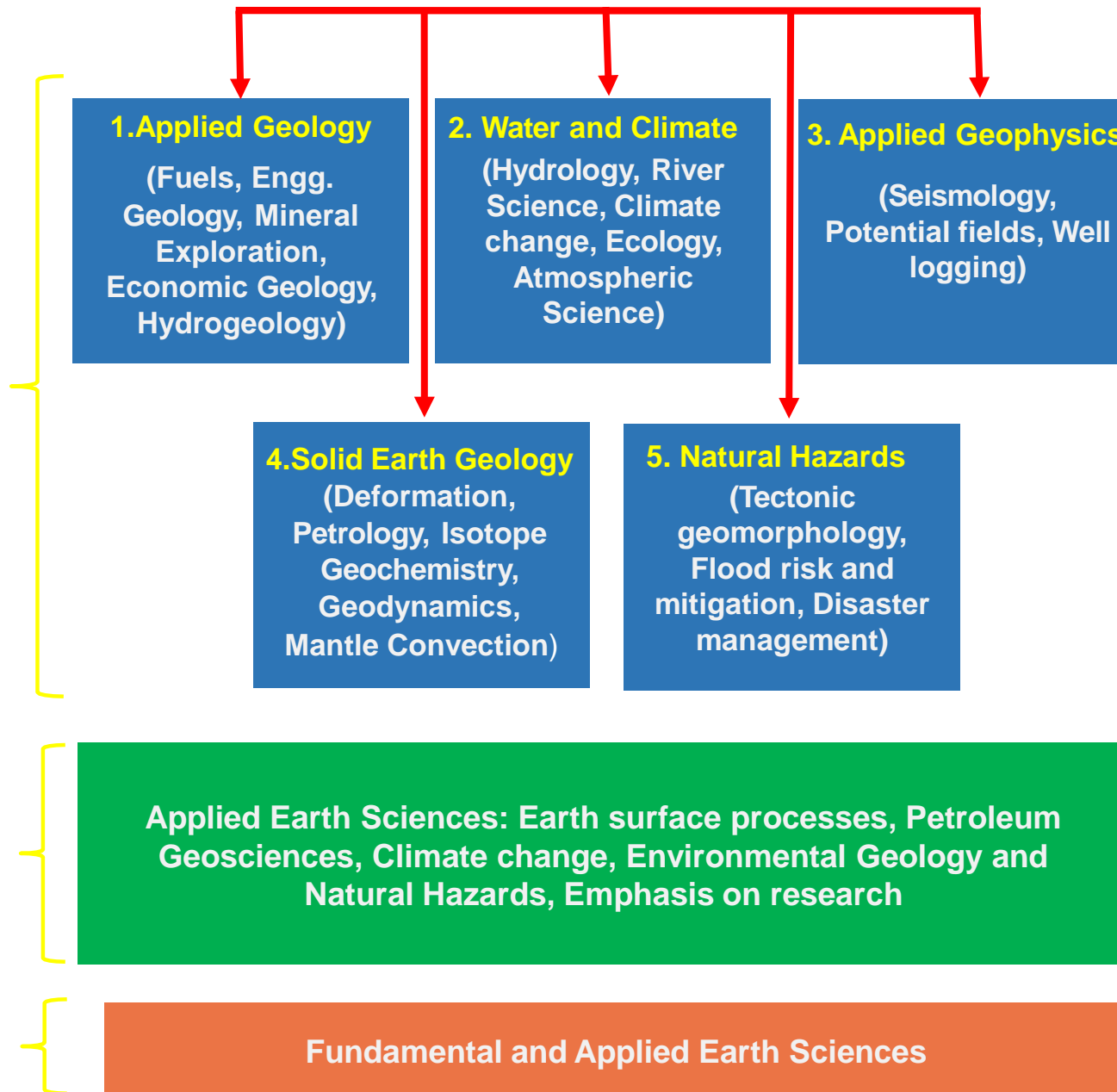
## **About Us**

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**

- 1.To provide high quality manpower in Earth Sciences, where intellectual foundations and traditions are anchored in the (a) integration of quantitative data across various Earth systems, and (b) application of geological, geophysical and other related analytical methods.
- 2.To develop academic programmes in Earth Sciences that will focus on the conjunctive use of field, experimental, analytical and numerical approaches.
- 3.To develop high quality research programmes in areas of water, climate change, energy, natural hazards and at their interfaces.

# Academic Programs and Specializations



## Compulsory Courses

- Mathematics for Earth Sciences
- Remote Sensing and GIS for Geo-resource Evaluation
- Geophysical Methods
- Instrumentation in Earth Sciences

## Elective Courses

- Aqueous Geochemistry
- River Science
- Isotope Geochemistry and Applications
- Geology and Geochemistry of Petroleum
- Applied Sedimentology and Basin Analysis
- Advanced Structural Geology
- Solid Earth Geophysics
- Experimental Rock Mechanics & Rock Physics
- Natural Hazards
- Active Tectonics and Paleoseismology

# Faculty



**Debajyoti Paul**, *Professor and Head*, PhD, Cornell University, USA  
(Geochemistry, Mantle Dynamics, Paleoclimate Reconstruction)



**Rajiv Sinha**, *Professor*, PhD, University of Cambridge, UK  
(River Science – River Morphology and Dynamics, Flood Hazards, Morphology-ecology Linkages, Remote Sensing and GIS Applications, Climate Change and Paleoclimate Reconstruction)



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



**Santanu Misra**, *Associate 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)





**Dibakar Ghosal**, *Assistant Professor*, PhD, IPGP, France  
(Exploration Seismology, Poroelastic attribute analysis, Modeling and Inversion, Subduction Tectonics)



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



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



**Tajdarul Hassan Syed**, *Associate Professor*, Ph.D., 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



**Anupam Bannerjee**, *Assistant Professor*, Ph. D., Indian Institute of Science Bangalore, India (2018)



### Amar Agarwal

Assistant Professor

PhD, IIT-Roorkee and KIT-Germany, 2015 (DAAD  
Sandwich model)



### Boddepalli Govindarao,

Assistant Professor. Ph. D., IIT Kharagpur,  
India, 2019.

Ore Geology

Experimental Sulfide Mineralogy

## AWARDS & HONOURS

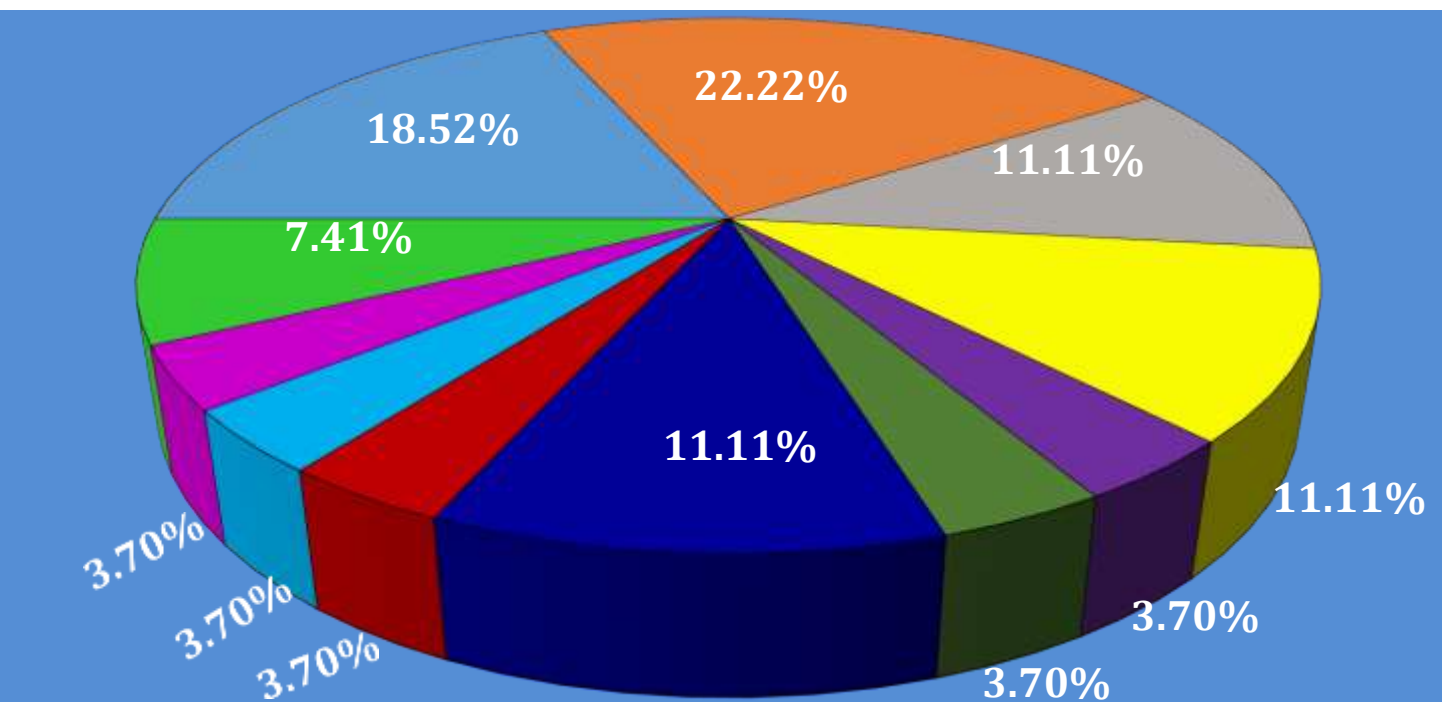
Prof. Javed N. Malik Recipient, National Geoscience Award, Ministry of Mines (2016)

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

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

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

## Ongoing Projects (Sanctioned Funds and Funding Agencies)



Funding Agency	Sanctioned Amount
DST (5)	4,51,85,440
SERB (6)	1,74,53,900
MOES (3)	4,36,60,600
IITK (3)	3,78,22,700
KDMIPE (1)	55,22,105
INCOIS (1)	1,49,41,500
L&T-GU (3)	43,12,500
QPL (1)	5,80,000
IDRC (1)	94,00,000
IIRS (1)	15,00,000
MOWR (2)	84,58,000

- DST (5)      ■ SERB (6)      ■ MOES (3)      ■ IITK (3)
- KDMIPE (1)      ■ INCOIS (1)      ■ L&T-GU (3)      ■ QPL (1)
- IDRC (1)      ■ IIRS (1)      ■ MOWR (2)

## ONGOING PROJECT

- Active fault, paleoseismic and crustal deformation in NW and central Himalaya India : an integrated approach towards seismic hazard assessment. *MOES*. **J. N. Malik**
- Dynamics of subduction interface and its implication for earthquake generating frictional sliding to volcano feeding partial melting in convergent plate tectonic boundaries. *DST*. **Santanu Misra**.
- Paleo-seismic and paleo-tsunami investigations along south-middle Andaman & car Nico bar islands towards earthquake & tsunami hazard assessment of A&N islands. *INCOIS*. **J. N. Malik**
- Deltaic environments, vulnerability and climate change: migration and adaptation and its policy implications (DECCCMA). *IDRC*. **Rajiv Sinha**
- Establishing A critical zone observatory (CZO) in the ganga basin: focus on water balance, water quality, and hydrometeorological information system. *MOES*. **Debajyoti Paul**.
- An organometallic fingerprinting proxy to locate shale oil pools. *KDIMPE*. **Indra Shekhar Sen**
- Development of ground water flow models and preparation of aquifer management plans study area (Panjab and Haryana). *MOWR*. **Rajiv Sinha**
- Integrated geophysical study in the east geothermal province hats belt, Odisha, India : an insight into the geotherma system and tectonic set up. *DST*. **Animesh Mandal**
- Characterization of the frictional properties and seismic-aseismic transitions in active faults of the Himalaya: an experimental investigation. *SERB*. **Santanu Misra**



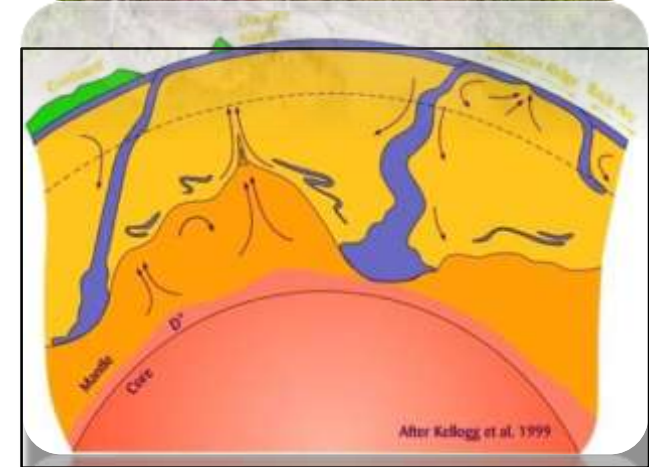
## ONGOING PROJECT

- Drainage reorganization paleoclimate reconstruction and sediment sourcing in the (paleo-) Yamuna plains using A multi-proxy approach-reg. *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 ne 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**
- To Infer The Sub Ice Geology And Validation Of The Geophysical Data Of Princess Elizabeth Land And Aurora Basin Of Wilkes Land. *SERB*. **Indra Shekhar 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

## Earth's Surface Processes

- Landscape evolution models-catchment scale models for sediment flux assessment
- Critical zone research-establishment of critical zone laboratory for monitoring of hydrological, ecological and geomorphic processes at sub-catchment scale; identification of 'tipping point' in natural system
- Geomorphic features of active tectonics-geomorphic indices, morphometric analysis, Remote sensing and GIS methods



## Geochemistry and Mantle Dynamics

- Layered vs whole mantle convection
- Implication for crustal evolution, heat flow and ultimately the vigor of plate tectonics
- Open system geochemical evolution models
- Evolution of Indian lithosphere

## Paleoclimate Reconstruction

- Paleoclimate reconstruction using sedimentary archives
- Long term (Quaternary) and short term (millennium) climate change
- Multi-proxy approach using continental archives such as river floodplains, lakes and carbonates



# RESEARCH AREAS

## Hydrocarbon Exploration

- Use of non-traditional isotopes and long-lived radiogenic rhenium-osmium isotopes in petroleum exploration and exploitation
- Application and development of new inorganic tools in hydrocarbon exploration

## River Science

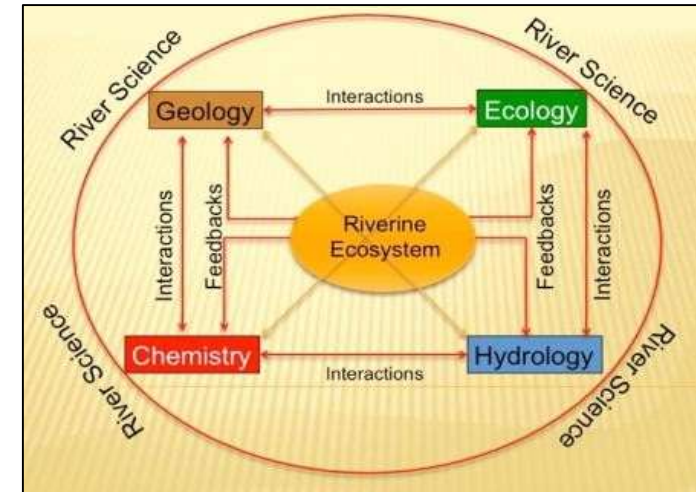
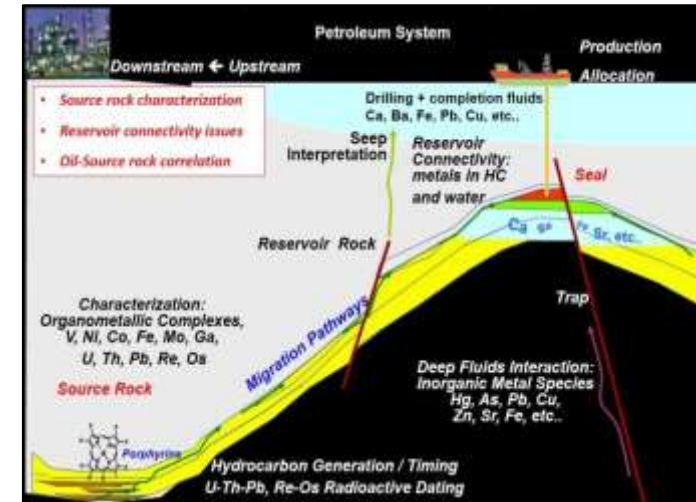
- Human transformations of river system-impact of LULC, anthropogenic interventions and overexploitation on river form and processes
- Environmental flow and river health assessment
- River morphodynamics and bank erosion
- River-cryosphere interaction-impact of climate change and melting of glaciers; isotopic methods of mass balance

## Environmental Science

Biological cycles of pollutants in the environment by quantifying anthropogenic element

Soil erosion and total denudation on land

Impact of aerosols and aeolian dust, sea-salt spray, soil erosion and volcanic emissions on chemical fluxes on Earth's surface





# RESEARCH AREAS

## Paleoseismology and Paleo-tsunami study

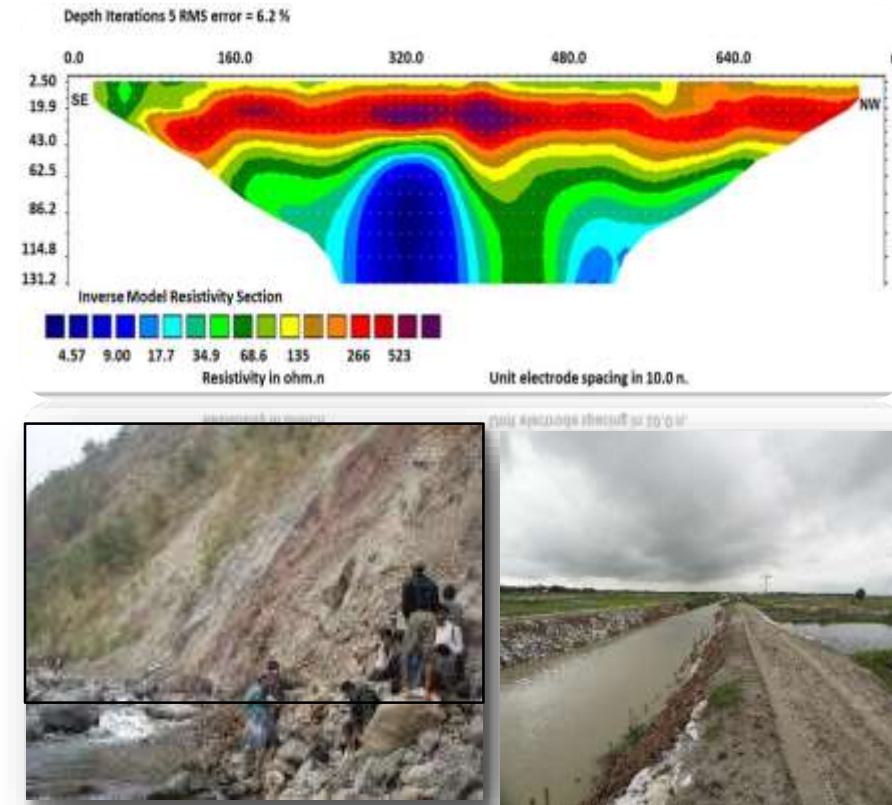
- Active Fault Mapping in Himalaya and Kutch
- GPS measurement-crustal deformation studies in NW Himalaya
- Paleo-tsunami investigation in Andaman & Nicobar islands

## Natural Hazards

- Landslides and slope stability
- River flood risk assessment
- Coastal hazards and vulnerability assessment

## Groundwater Structure and Dynamics

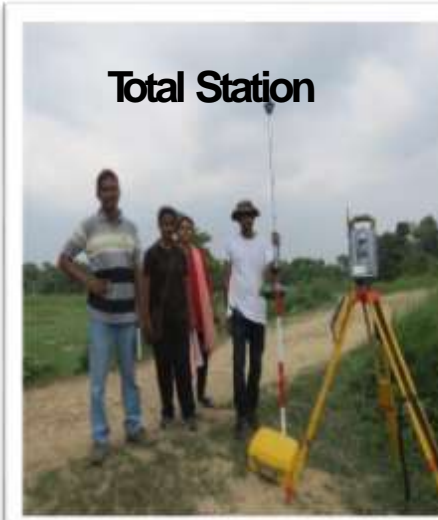
- Geomorphic controls on groundwater aquifers-integrated approach using borehole data and modeling
- Modeling groundwater flow dynamics under varying stresses-historical water level data analysis, isotopic methods for source characterization and recharge estimation; ground water modeling.



# RESEARCH FACILITIES

## River surveys

- Inflatable boat and engine
- Acoustic Doppler current profiler(ADCP)
- Echo sounder
- Hydro bios gravity corer
- Sediment dredger



## Terrain mapping

- Total Station
- Kinematic Differential GPS
- Image Rover
- Unmanned Airborne Vehicle (UAV)
- LIDAR Terrestrial Scanner
- Handheld GPS
- Ground penetrating radar(GPR)



## Geophysics lab

- Resistivity meter (VES)
- Resistivity profiling (SYSCAL)
- Well logger

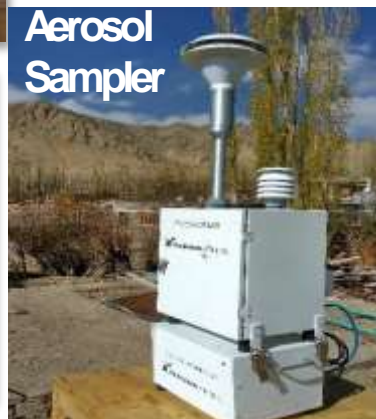




# RESEARCH FACILITIES

## Analytical facilities

- X-ray Fluorescence (XRF)
- Atomic Absorption Spectrophotometer (AAS)
- Inductively coupled plasma mass spectrometry (ICP-MS)
- Isotope-ratio Mass Spectrometer (IRMS)
- Laser Water Isotope Analyzer
- Nutrient Analyzer
- Bartington Magnetic Susceptibility Meter - dual frequency
- Core Archival and Analysis Facility
- Core Scanner (DCS)
- Eutech Multi-probe water quality bench meter
- Metal-free Clean Lab



# RESEARCH FACILITIES

## Sedimentology and Microscopy facilities

Sedigraph

X-ray Diffractometer (XRD)

Optically stimulated luminescence (OSL)

Sieve shaker

Vibratory cup mill

Vacuum impregnation unit

Ultrasonic bath

Thin section preparation unit

Scanning Electron Microscope (SEM)

Leica Optical Microscopes and imaging system

Nikon Stereo zoom microscope SMZ-1000

Cathode-luminescence Microscope



Vacuum chamber



UIC Coulometer



Low speed diamond cut-off saw



Stereo Zoom Microscope



Reflecting Microscope



High speed diamond cut-off saw



Diamond Core Drill



Particle Size Analyser



Ultra-Thin Sectioning Bench-top



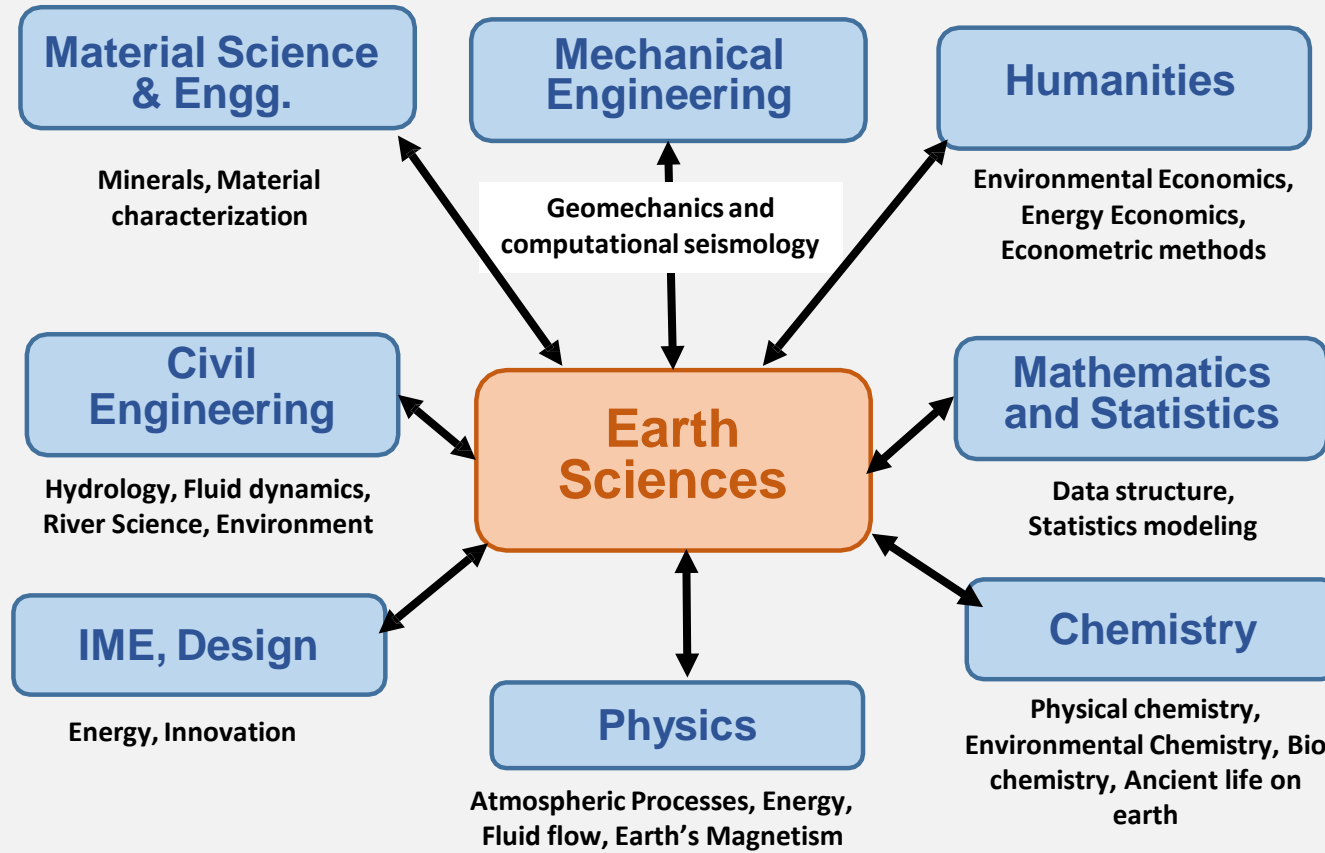
Isodynamic magnetic separator



OSL Reader



# Synergy with other Departments





# Contact Us

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