LIST OF DEPARTMENTS

APPLIED GEOLOGY

APPLIED GEOPHYSICS

MANAGEMENT STUDIES

MATHEMATICS AND COMPUTING

PHYSICS

COMPUTER SCIENCE ENGINEERING

ELECTRONICS ENGINEERING

ELECTRICAL ENGINEERING

MINING ENGINEERING

MINING MACHINERY

PETROLEUM ENGINEERING

CHEMICAL ENGINEERING

CHEMISTRY

CIVIL ENGINNERING

FUEL, MINERAL AND METALLURGICAL ENGINEERING

HUMANITIES AND SOCIAL SCIENCE

ENVIRONMENTAL SCIENCE & ENGINEERING

MECHANICAL ENGINEERING

APPLIED GEOLOGY

❑ Mineral/Hydrocarbon exploration and mineral economics

- Gold, copper, iron and manganese
- Coal, lignite, Shale gas
- Geostatistics
- Micropaleontology and hydrocarbon exploration

❑ Petrology and geochemistry

- High temperature-pressure rock system
- Geochemical evolution of the Earth and planetary bodies
- Low-T geochemistry of fluoride and arsenic

❑ Structural/Engineering Geology and Tectonics

- Structural control of ores and hydrocarbons
- Active fault mapping, earthquake, engg geol and landslide evaluation

❑ Hydrogeology, Remote sensing and GIS

- Hyperspectral remote sensing and GIS

APPLIED GEOPHYSICS

❑ Mineral Exploration

- Near Surface Geophysics & Ore-Body Characterizations
- Gravity, Magnetic, Resistivity, IP, SP, AMT, Seismic & Well Logging Measurements
- Rock and Petro Physics

❑ Solid Earth & Geodynamics

- Seismological Data Analysis & Full Waveform Inversion
- Earthquake Early Warning System
- MT and AMT Survey
- FEM Modeling & Fluid Dynamics
- Geodynamo Modelling

❑ Fossil Fuel Exploration

- Geomechanical Modeling
- Computational Geophysics & Reservoir Characterization
- Geo-cellular Modelling & Rock Physics
- EOR and Multi-Component Seismic Analysis

❑ Groundwater Exploration

- Fracture Characterization using Discrete Dual Porosity (DDP) Modeling
- Bayesian Neural Network Modeling
- Spatial and Temporal Variability of Aquifer Parameters & Pollution

❑ Geospatial Technology

- Remote Sensing and GIS for Mineral exploration
- Predicting Geomagnetic Secular Variation
- Hazard Mapping

❑ Geophysical Inversion & Data-Driven Modelling

- Basement Depth Modelling using Gravity-Magnetic Data
- Fault Geometry Characterization
- Seismic Reservoir Characterization
- Joint-Inversion and ML
- Swarm Intelligence

CHEMISTRY

Materials:

- Polymers for Water remediation & Drug delivery
- Materials for corrosion control
- Microwave absorbing materials
- Supramolecular Chemistry

Synthesis:

- Inorganic Synthesis
  - Organometallic & Coordination Chemistry
  - MOFs and cluster complexes
- Organic Synthesis

  Methodology Development

  Photochemical synthesis

  Carbohydrate Synthesis

Catalysis:

- Heterogeneous Catalysis
- Nanocatalysis
- Homogeneous Catalysis using Organometallics

Environment & Energy Research:

- Electrochemical and Chemical Sensing of toxic elements in water/environment
- Artificial Photosynthesis

- ❑ Faculty members with international exposure
- ❑ Sponsored projects in interdisciplinary research areas
- ❑ Career-ready Postgraduates, with the skills to succeed

CHEMICAL ENGINEERING

- **Clean Coal & other Energy Resource Material Utilization**
  - Gasification and Value-Added Chemicals
  - Dry Coal Beneficiation
  - Fly Ash Densification and Utilization
  - Chemical Looping Gasification
- **Environment:**
  - Physico-chemical and Novel treatment of Wastewater
  - CO_2 Capture and Utilization
- **Process intensification using most advanced technologies**
  - Process Modelling, Simulation and Optimization
  - Novel Equipment Design & Concept Proofing
  - Rheology of Complex Fluids
- **Materials**
  - Synthesis and Utilization of Nano-Materials
  - Functional and Smart Coatings.

CIVIL ENGINNERING

Structural Engineering:

- Composite structures
- Earthquake and blast loading effects on structures
- Strengthening and retrofitting techniques of structures
- Recycled materials for construction

Geotechnical Engineering:

- Modeling of foundation systems
- Sustainable geomaterial
- Earthquake geotechnics
- Ground improvement for infrastructures

Water Resources Engineering:

- Hydrological extremes
- Stochastic modelling
- Groundwater Hydraulics

Transportation Engineering:

- Traffic flow modeling

- ❑ Faculty members with international exposure and collaborations
- ❑ Sponsored projects in relevant research areas
- ❑ Some basic research facilities

COMPUTER SCIENCE ENGINEERING

Machine Learning, Artificial Intelligence

- Computer vision
- Modeling and simulation
- ANN, Optimization, Classification
- Deep Learning

Internet of Things (IoT) & Cloud

- QoS parameters and ranking
- Healthcare Systems
- Underground Mine Monitoring
- Cloud, Big Data, Bioinformatics

Security:

- Adhoc & Wireless Networks
- Wireless and Mobile

Image and Video Processing:

- Computer Vision
- Real time System Design
- Biometrics

❑ Faculty members with international exposure

❑ Sponsored projects in relevant research areas

ELECTRICAL ENGINEERING

Power System:

Modeling and simulation in the areas of

- Active power control strategies for DG.
- Reliability assessment of DG.
- Fault-ride through capability for wind energy system
- Power system analysis and control by soft-computation.

Power Electronics:

- Multilevel inverter based grid tied photo-voltaic system.
- Updated PV system.
- New inverter topologies.
- Modeling and simulation of energy balance in hybrid AC/DC micro-grid.
- Contactless, Energy efficient and green energy based induction heating.

Machines & Drives:

Design of :

- Energy efficient electrical machines.
- Sensorless speed estimator.
- Fault-tolerant control schemes.

High Voltage Engineering:

- Low cost portable insulation response measurement and analysis equipment.
- Thermal aging/degradation in dry type transformer.
- Bio-degradable alternative dielectric liquids.

Photonics:

- Modeling and analysis of photonic integrated circuits.

ELECTRONICS ENGINEERING

Communication and Signal Processing:

- Signal Processing algorithms for wireless communication for 4G and 5G communication
- Intelligent Signal Processing for Cognitive radio
- Resource Allocation for Next Generation Networks
- Speech enhancement

Optoelectronics and Optical Communication:

- Modeling and simulation in the areas of
  - Microwave photonics
  - Silicon photonics.
  - Nanophotonics
  - Photonic Integrated Circuits
- Facility for growth of Solar PV Cells and other opto-electronic Devices using PVD (RF & DC sputtering, Thermal and E-beam evaporation); Thin film characterization [under CERE]

VLSI Design:

- Simulation on novel materials for development of next generation on-chip interconnects, FETs and ultra-sensitive sensors
- Memristor based circuit design
- Design of Nano-scaled MOS Devices and circuits
- Smart embedded microsensors (MEMS, MOEMS etc.)

RF and Microwave:

- MIMO based Antenna, Surface Integrated Waveguide (SIW) based Antenna
- Metamaterial for RF & Microwave Engg.
- Anechoic chamber facility

ENVIRONMENTAL SCIENCE & ENGINEERING

Air Pollution & Control

- Air Quality Assessment & Emission Inventory
- Air Pollution Modeling
- Vehicular Emission Control & Modeling

Water Pollution & Control

- Nano-technology for Water and Wastewater Application
- Electro-chemical Techniques for Emerging and priority pollutants
- Modeling and Simulation of High Rate Bio-reactor
- Contaminant Transport Modelling

Solid Waste Management

- Utilization of Waste as a Resource
- Application of RS & GIS in Solid Waste Management
- Microbial Composting

Mining Environment

- Augmentation of Mine Water for Potable Use
- Ecological Restoration of Mine Degraded Lands
- EIA/EMP & Mine Legislation
- Mine Closure

Environmental Biotechnology

- Algal Bio-fuel Production
- Microbial Remediation of Emerging Pollutants
- Gene Expression Studies
- Phyto-remediation

Fuel, Mineral and Metallurgical Engineering

Sustained Institute-Industry Interaction

MINERAL PROCESSING

- Comminution and classification
- Gravity concentration Technologies
- Froth Flotation
- Flocculation and dewatering

COAL PREPARATION AND UTILIZATION

- Coal comminution and classification
- Gravity separation technologies
- Combustion, carbonization and gasification

EXTRACTIVE METALLURGY

- Leaching metal values form lean grade ore
- Pelletization and sintering

HUMANITIES AND SOCIAL SCIENCE

English Literature and Popular Culture:

- English Literature of all period & genre
- Tennyson and Eliotan Studies
- Film Studies & New Media
- Adaptation
- Iconography and Graphic Narratives
- Disability Studies
- Popular Culture (Fashion, Food, Gender, Body and so on)
- Post Colonial Literature
- South Asian Literature

Indian Writing in English:

- Indian Feminist Theatre
- Indian Writing in English by Women
- Indian English Fiction

English Language Studies

- Translation studies
- ELT/ESP
- Study of lesser known languages of Jharkhand

Environment and Ethics:

- Environmental Ethics
- Environmental Sustainability and Business Ethics

Indian Philosophy

- Buddhist Philosophy

Gender Studies

- Women and Gender Studies
- Transgenders and Human rights

MANAGEMENT STUDIES

Marketing:

- Digital Marketing
- Channel Management
- Social Psychology of Consumer Behaviour

Operations Management:

- Productivity and Human Factor Engineering
- Supply Chain Management
- Remanufacturing and Reverse Logistics

Finance:

- Corporate Governance and Financial Performance
- Sustainability Reporting
- Financial Markets

Human Resource Management:

- Industrial Psychology
- Industrial Relations
- Personnel Management

MATHEMATICS AND COMPUTING

❑ Applied Mathematics

- Celestial Mechanics
- Chaotic/Non-linear Dynamical Systems
- Elastodynamics and Fracture Mechanics
- Fluid Dynamics
- Solute Transport Modeling

❑ Pure Mathematics

- Algebraic Coding Theory
- Fourier and Wavelet Analysis
- F-transform
- Operator Theory

❑ Statistics and Operation Research

- Biostatistics
- Optimization Techniques
- Statistical Inference
- Survey Sampling

❑ Theoretical Computer Science

- Algorithm Design
- Applied Graph Theory
- Fuzzy Automata
- Software Engineering

MECHANICAL ENGINEERING

Thermo-fluid Engineering:

Solar Energy

- ❑ Jet plate solar air heater

Flow characterization

- ❑ Flow visualisation
- ❑ Microfluidics
  - * Micro channel cooling

Refrigeration systems

- ❑ Sorption systems

Thermal Measurements

- ❑ Fast response thermal sensors.

Aero-dynamics and Acoustic

- ❑ Reduction of aerofoil-turbulence noise
- ❑ Acoustic properties of jet engines.
- ❑ Aerodynamic drag reduction

Low head water turbine

- ❑ Hydrokinetic Turbine

Fluid-structure interaction

- ❑ Flow past bluff body

Machine Design:

Composite Materials

- ❑ Vibration analysis of Piezo-composite
- ❑ Dental Polymeric Nano-composite Materials,
- ❑ Wear & Friction Study of Nano Composites.

Twin Rotor Control

- ❑ MIMO analysis, stability analysis

Reverse Engineering

- ❑ Surface design

Technical acoustics

- ❑ Muffler design, acoustic damper

Manufacturing Engineering:

LASER processing of materials

- ❑ Laser cladding

Hybrid micro-machining

- ❑ Electro chemical discharge machining
- ❑ Ultrasonic vibration assisted machining

Nano/ Micro machining

- ❑ Semi high speed mechanical micro machining

MINING MACHINERY

Mine Mechanization & Automation:

- Hydraulic power steering system used in articulated off-road vehicles setup
- Hydraulic system using accumulator for energy efficient drives used in off-road vehicles setup
- Two motor hydrostatic summation drive test set up
- Hydraulic test set up with different power sources
- Displacement controlled energy saving hydraulic circuit using series-parallel accumulator setup

Reliability & Maintenance:

- Reliability analysis of dumper engine
- Reliability analysis of Dragline excavator
- Remaining useful life prediction of lubricating oil
- Systat 13.1 and Weibull ++

Safety & Ergonomics:

- Whole-body vibration analysis of tractor and semitrailer
- Ergonomic study of drill machine
- Vibration exposure assessment on Dumper

- ❑ Design optimization of excavator components like bucket, arm and boom [Collaborative project with HEC, Ranchi]
- ❑ Condition monitoring and vibration analysis of HEMMs [DST]
- ❑ Design of energy efficient hydraulic drives for mining equipment components [FIST, DST Projects on-going]
- ❑ Rock stability and fracture analysis [Ministry of Mines Project, on-going]
- ❑ Development of underground mines portable wireless environment monitoring system (under DST(SERB) sponsored project)
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- ❑ Facilities for research in the area of mine electrical and control
- ❑ CAE & advanced research lab facilities for simulation based research and analysis
- ❑ Facilities in the area of auxiliary mining equipment such mine pumps, compressors and fans.

MINING ENGINEERING

MINE PLANNING AND DESIGN :

- Modeling and Simulation
- CAMPAD: SURPAC, MINEX, DATAMINE and Other Packages

EXCAVATION TECHNOLOGY:

- Design and Development of Large Caverns
- Design of Mechanical Cutters
- Drilling and Blasting Technology for Mining and Civil Projects
- Development of Low Density Explosives, Mass Blasting

GEOMECHANICS:

- Stability Analysis of Excavations and Slopes
- In-situ Stress Measurement and Design
- Design of Automated Support Systems for Deep Mines

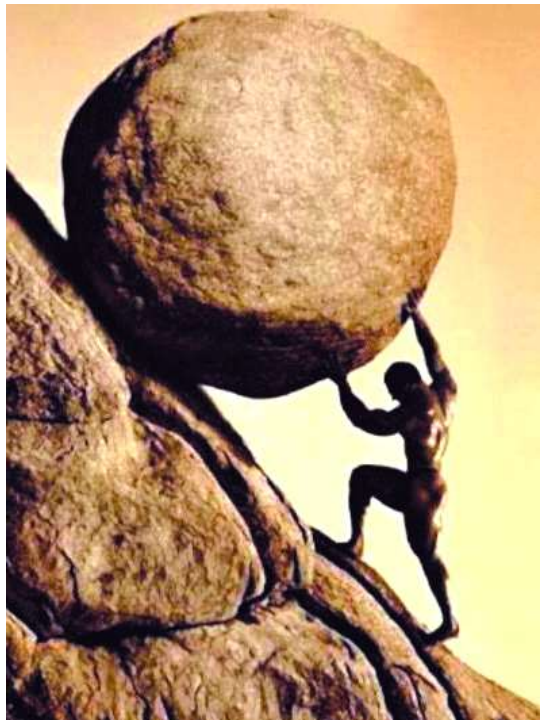
MINE VENTILATION, ENVIRONMENT AND SAFETY:

- Risk Based Mine Safety Management System
- Simulation and Modeling of underground mine ventilation system
- Energy Efficient Mine Ventilation and Design of Air Cooling System for underground mine
- Assessment and Control of Sub-surface Environment: Radiation, Gases, Fire etc.

GEOSPATIAL TECHNOLOGIES:

- Mining Induced Land Dynamics Assessment and Change Detection
- Digital Mine Mapping and 3D Visualization
- Remote Sensing based Mine Surveillance
- Mineral Resource Mapping

PETROLEUM ENGINEERING



Enhanced Oil Recovery

- Optimization of rheological and interfacial properties of chemical slugs for EOR
- Experimental ASP flooding design
- Synthesis of tailor-made Surfactants & Polymers for specific reservoirs
- Low-Sal & Smart water flooding
- Nanotechnology in EOR
- Reservoir Characterization facilities
- Reservoir Modelling & Simulation and Lab to field up-scaling

Unconventional and Renewal Energy Resources

- Gas hydrates Formation and dissociation apparatus and studies
- Kinetic modelling of gas hydrate formation and dissociation
- CBM-Adsorption & Desorption facility
- CBM reservoir devolvement: reservoir modelling and Simulation
- Shale oil and gas reserve characterization
- Bio Energy and fuels

Oil & Gas well Production

- Flow Assurance techniques: Inhibition and Prevention
- Wax, scale and Gas hydrate prevention
- Profile modification: water shut off jobs
- Well stimulation: Hydraulic Fracturing
- HF fluid design and testing
- Fracture pressure detection and proppant optimization
- Sand control, gravel packing fluids and chemical sand consolidation

Drilling Fluid

- DF rheological evaluation
- DF for Shale/CBM and Gas Hydrates
- HP HT and Smart well DF

Others

- Oil field tracer
- Nanoparticle and nanofluid in Drilling/production operation
- Oil field waste water treatment

PHYSICS

Materials Science:

- Defect structure analysis of solid state materials.
- Development of materials for light emitting, solar cells and energy storage devices.
- Electronic band structure calculations.

Spectroscopy:

- Optical sensing using up-conversion spectroscopy.
- Development of optical fibre based sensors for refractive index and pH measurements.

Bio-medical Science:

- Self life and activity measurement using bio-speckle technique.
- Temperature and R.I. measurement using interferometers.
- Studies on nonlinearity of bio-molecules for disease diagnosis.

Theoretical Physics:

- String Theory and Black hole Physics.
- Computational design and simulation of Organic Semiconductors and organic photovoltaics.
- Computer code for structural parameters of complex systems.