

Research at IEST, Shibpur

High-end research has always been a high priority area in the institute. Apart from under graduate and post graduate teaching, the faculty members are involved in active research sponsored by numerous Government and private agencies, vibrantly responding to the national mission of transforming India from the present global market place to a center of indigenous productivity.

Apart from fundamental research in Science and Technology regular correspondence with the industry and corporate sector is carried out. Industry-Institute Partnership of IEST with different corporate collaborators already exists in various areas. Initiatives are taken for real life validation of lab-scale prototypes followed by transfer of technology to the industry. Everybody's dream is to establish the brand "IEST, Shibpur" throughout the nation.

Currently, more than 100 sponsored research projects are in various stages of implementation in the institute. The total fund received under sponsored research fund in the financial year 2014-15 is more than 14 crores. Furthermore, the faculty members have also carried out industrial consultancy projects for a total of about 3.5 crores in the same financial year.

Although, the faculty members are actively pursuing research in almost all relevant areas, the new theme of research for the institute is **"A Greener and Smarter World"**. The research activities at the institute can be broadly be categorized into the following heads:

A. Energy

- Magnetic fault current limiter.
- Analysis and development of a single-axis control repulsive-type magnetic bearing.
- Front surface glass texturation for improving performance of amorphous silicon solar cell.
- Efficiency enhancement in silicon solar cells by application of nanoparticles .
- Fuel cell technology and dye sensitized plasmonic solar cell.
- Single phase grid connected solar photovoltaic systems.
- Coalbed Methane and shale Gas reservoir characterization

B. Environment

- Arsenic and Fluoride remediation filter for rural population.
- Drainage and Flood hazard mitigation.
- CO₂ Sequestration into coal seams and saline aquifers.
- Determination of land use inventory of the mining areas reclamation plan
- Hydrodynamic modeling of sediment transport in coastal areas.
- Landslide hazard zonation and creation of hazard map
- Assessment and management of ground water resources.

C. Material Science

- CH₄ and CO₂ sorption in coal and their variations with coal properties.
- Open-shell molecules: A challenge to electronic structure theory
- Nanostructured Advanced material.
- Synthesis of Nitrogen containing heterocycles.
- Synthesis and characterization of efficient optical materials and application in nonlinear optics.
- Visible-light-driven synthesis of 2-substituted Benzimidazole and Benzothiazole.
- Silicon nanocrystals and nanoparticles for photonic, photovoltaic and sensing devices.
- Nanocomposites for applications as thermoelectric (TE) materials and gas sensors.
- γ -Fe₂O₃ nano-particles: Effective photo-catalyst for the degradation of dyes in the waste-water treatment plant.

D. Bio-Medical Engineering and Mechatronics

- Wireless system for screening Electro-cardiographic assessment of miners in Indian coalfields. Ergonomic study of workers in underground coal mines.
- Impact Bio-Mechanics & Implant Bio-Mechanics.
- Water soluble carbon nano-onions in Bio-Imaging and crossing "Blood Brain Barrier."
- Chemodosimetric Based Fluorescence Chemosensor .
- DHP selective off-on/off responses of fluorescent zinc complex, its Bio-Imaging applications
- Plasma treatment on infected skin surfaces and skin cancer cell.
- Sensors, Communication and Information Technology
- Selection of sites for small hydropower stations in hilly areas using remote sensing and GIS.

- Gas leak hunter: A portable fast response sensitive unit for leak detection of methane/LPG gas.
- Methano-meter: A portable fast response sensitive measuring unit for methane/LPG gas.
- Coupled semiconductor thin films Carbon nanotubes and sensors
- Dispersion managed broadband fiber optic communication system.

E. Research for society

- Development of Solar Lantern & central charging station with monitoring system.
- Seismic vulnerability assessment of existing building.
- Passive control of seismically excited short linear structure.
- To improve groundwater resources management in arsenic affected areas (DeIPHE Project).
- Arsenic pollution on health in rural Bengal and sustainable technology solution (UKIERI Project).
- Failure analysis of cost effective hybrid laminated stiffened plates in marine structures & Geometric nonlinear thermo- mechanical analysis of FRP bridge deck.
- Health inspection of VidyasagrSetu Kolkata & Water supply lines to New Town.