



Indian Institute of Technology (ISM), Dhanbad

Research Facilities

Central Research Facility (CRF) and various other laboratories of all departments of the Institute have been equipped with major experimental facilities to enhance the academic and research potential of students and faculty members. A few major experimental facilities for the inter-disciplinary research are mentioned in the sub-sections below:

1. State-of-the-art Laboratories

Following listed laboratories are having facilities of International standards in its areas of core competence:

- ❖ *Mining Engineering: Rock Mechanics, Rock Excavation, Mine Ventilation, Mine Surveying;*
- ❖ *Applied Physics: Time Resolved Spectroscopy Laboratory, Biomedical Optics Laboratory. Nanophotonics Laboratory equipped with Physical Vapor Deposition System, XRD Laboratory;*
- ❖ *Petroleum Engineering: Natural Gas Hydrate, Enhanced Oil Recovery, Reservoir Engineering;*
- ❖ *Environmental Science and Engineering: Waste Water Engineering, Water Analysis, Air and Noise Pollution, Solid Waste Treatment, Rain Harvesting;*
- ❖ *Fuel and Mineral Engineering: Mineral Engineering, Coal Characterization, Fluidized Bed Combustion, Heat Treatment, Centrifugal Separation, Pilot Plant Gravity Separation;*
- ❖ *Applied Geology: Coal Petrology, Geotechnical Engineering, Geo-chemical, Geological Museum; Ore and Mining Geology Lab, Remote Sensing and GIS Lab, Geo-Statistical/Mathematical Geology Lab, Micro-paleontology Lab, Geo-Computational Lab, Petrology Lab, Structural Geology Lab, DST-FIST Lab*
- ❖ *Applied Mathematics: Three computer labs: (i) UGC-SAP Lab I- 30 systems (ii) UGC-SAP Lab II- 30 systems (iii) DST-FIST Lab 20 systems, Four servers (Two Red Hat LINUX based, One CentOS based other WINDOWS based), MATHEMATICA, thirty-one users network licenses, MATLAB, SPSS/CUDA C/C++, PyCUDA and other open source software, NVIDIA GPU Cards and three High End Supermicro Workstations(supported by DST FIST/ISRO Project/SERB Project)/ Support under NVIDIA GPU Education Centre (GEC), Awarded: 2014, NVIDIA Tesla Kepler K20c--two , NVIDIA Quadro 6000--two , NVIDIA GeForce GTX TITAN X(PG600-A04)--one , NVIDIA GTX 680 GPUs-two, NVIDIA Tesla C2070-two , NVIDIA Quadro 5000-one*

- ❖ *Petroleum Engineering: Drilling Fluid and Cementing Laboratory, Reservoir Engineering Laboratory, Production and Product Testing Laboratory, Process Engineering Laboratory, Computational Laboratory: Reservoir Characterization Center, EOR Laboratory, Gas Hydrates Laboratory, Coalbed Methane Laboratory, Instrumentation Laboratory, Multiphase flow Laboratory, Bioenergy and Fuels Laboratory, Flow Assurance Laboratory, Chemical Flooding Laboratory, Long Core Apparatus Laboratory.*
- ❖ *Applied Geophysics: Magneto-Telluric, Geophysical Instrumentation, Remote Sensing, Seismological Observatory.*
- ❖ *Mining Machinery Engineering: Power Hydraulics Laboratory, Material Handling laboratory, Whole body vibration and Drilling Engineering Laboratory.*
- ❖ *Instrumentation and Control Laboratory, Digital Signal Processing Laboratory, Fiber-optics Laboratory, Communication Laboratory, VLSI Laboratory, Computer and Simulation Laboratory, Microwave Laboratory, Digital Electronics Laboratory, Basic Electronics Laboratory and Microprocessor and Embedded Systems Laboratory.*
- ❖ *Mechanical Engineering: Air Conditioning and Refrigeration Laboratory, IC Engine and Thermal Engineering Laboratory, Heat and Mass Transfer Laboratory, CAD Laboratory, CAM Laboratory*
- ❖ *Power System Laboratory, Electrical Machine Laboratory, Measurement Laboratory and Power Electronics Laboratory.*
- ❖ *XRD Laboratory, SEM Laboratory, Biomedical Optics Laboratory.*
- ❖ *Parallel Processing Laboratory equipped with cluster of processors used for simulation, implementation, execution of parallel algorithms.*
- ❖ *VLSI Laboratory for design, simulation and testing of MOS, MOS gates, MOS circuits using software like NetSim (NI Multi-sim).*
- ❖ *Network Laboratory equipped with LAN trainer kit, QualNet simulator for simulation and testing of LAN protocols, routing protocols for both wired and wireless networks.*
- ❖ *Security Laboratory for simulation, testing of cryptographic algorithms and protocols like PGP, SET, IPSec, etc.*
- ❖ *Digital Electronics and Computer Organization Laboratory (Hardware Laboratory) for performing experiments of digital electronics and computer organization.*
- ❖ *Two programming laboratories for B.Tech and M.Tech students for implementing their assignments using common programming languages, simulators and rapid prototyping tool like MATLAB.*
- ❖ *Central server systems consisting of IBM e-server x Series 235, X86 based PC, e-Server x Series 236, HP Xeon Proliant ML350e Gen8, HP Proliant DL 360, HP server TC2120, etc.*

2. Sponsored R&D Projects

The Institute continued its growth in R&D projects in the year 2017-18 and executed projects worth Rs. 1273.56 lakhs sponsored in the state-of- art research in diverse disciplines of engineering, science and management. The major sponsoring agencies are M/s Coal India Limited; Department of Science & Technology; Defence Research Development Organization; Ministry of Mines; Ministry of Coal; Ministry of Environment; Forest and Climate Change; Ministry of Information & Communication Technology; Indian Space Research Organization; Uranium Corporation of India Limited; M/s Schlumberger and others. The execution of such research projects have led to significant discoveries and development of major technologies, which are given below:

- Development of Self-Advancing Goaf Edge Support (SAGES) for improvement of safety in underground coal mines.
- Development and implementation of technology of mine cooling and air conditioning for improving underground mine environment upto 1 km depth from surface.
- Development of “VENTSYS” software for solving complex sub-surface mine ventilation problems including mine fire.
- LASER guided and gyro-based precision surveying technology for correlation in underground mines and alignment of tunnels.
- Under-water drilling and blasting technology for deepening of existing ports and intake channels for movement of large ships and heavy vessels for docking in the ports.
- Design and development of Caverns for Strategic Petroleum Reserve (SPR).
- Design and implementation of mine ventilation system for reduction in radiation dose in all the seven underground mines of Uranium Corporation of India Ltd., operating upto a depth of 940 m from the surface.
- Design and implementation of particulate Emission Control System for Coke-Oven Plants.
- Enrichment of low grade iron ore fines for use in steel making.
- FRP (Fibre Reinforced Plastic) blades for high capacity mine ventilation fans.
- Development of system for conservation of energy in main mine ventilation fans.
- Design and development of Jigs and Heavy Media Cyclones for treatment of different coals.
- Development of pilot scale technology for underground coal gasification.
- Discovery of Chromite deposits in Sukinda Chromite Belt.
- Electrical Resistivity Imaging and Self-Potential Survey for locating Fracture Zones and Seepage Analysis in coal mines.
- Energy Efficient Hydrostatic transmission system for off road vehicles using two motor summation drive.
- Integrated sensor technology for mobile robotic application in mining industry.
- Development of performance standardization techniques for Surface Continuous Miners for enhancing indigenous surface miner usage in coal and limestone mines in collaboration with L&T.

A list of R&D projects executed during the financial year 2017-18 is provided in table given below:

R&D Projects executed in the year 2017-18:

Sl. No.	Project No.	Title of the Project	PI/CI, Co-PI/Co-CI & PI(s)	Department	Total cost of the project (Rs. In lakhs)	Sponsoring Agency
1	DST(SERB)/(168)/2017-2018/511/ME	An Investigation into the Effects of Intrinsic Properties of Indian Coals on Spontaneous Combustion Process and Coal Mine Fires.	Dr. D. P. Mishra, Asstt. Professor Prof. V. Raghvan, NCCRD, IIT, Madras	Mining Engineering	21.45	DST (SERB)
2	DST(SERB)/(169)/2017-2018/512/AM	Joint Modeling of Event Time and Non-Ignorable Missing Covariate Data in Survival and Longitudinal Analysis.	Dr. G. K. Vishwakarma, Asstt. Professor Dr. Atanu Bhattacharya, Asstt. Professor	Applied Mathematics	15.68	DST (SERB)
3	ISRO/(6)/2017-2018 / 513/ECE	A Compact Low Volume Dielectric Resonator Antenna Loaded with Metamaterial Structure for Small Satellite Application.	Dr. . Raghvendra Kr. Chaudhary, Asstt. Professor Dr. R. K. Gangwar, Asstt. Professor	Electronics Engineering	20.10	ISRO
4	CIL(7)/2017-2018/ 514/FME	Design of Cost Effective Process Flowsheet for Improved Washing Efficiency of Indian Coking and Non-coking Coals.	Prof. Nikkam Suresh Dr. Shravan Kumar, Asstt. Professor	Fuel and Mineral Engineering	1212.98	CIL
5	ISRO/(7)/2017-2018/515/AP	Electron Induced Chemistry of Molecules Relevant to Space Applications.	Dr. Bobby Antony, Associate Professor	Applied Physics	24.56	ISRO
6	NIRDPR/2017-2018/516/MS	Behavioral and Cultural Causalities Affecting MGNREGA Implementation at Local Governmental Bodies : A Critical Assessment in Jharkhand.	Dr. Bibhas Chandra, Asstt. Professor,	Management Studies	10.93	NIRDPR
7	DST(SERB)/(170)/2017-2018/517/CE	Static Stability Analysis of Carbon Nanotube Reinforced Laminated Composite Plate Subjected to Axial Compressive Loading.	Dr. Tanish Dey, Asstt. Professor	Civil Engineering	29.85	DST (SERB)
8	CSIR(22)/2017-2018/518/AM	Mathematical Modeling of Dynamical Diseases in the Human Brain.	Prof. R K Upadhyay	Applied Mathematics	5.87	CSIR
9	IIT(ISM) & Tata Steel (MoU)/2017-2018/519/Instt.	Selection, Detailed Characterization and Optimization of Commercial Flocculants Towards the Treatment of Major Water Consuming Unit of Steel Plant.	Dr. Sagar Pal, Assoc. Professor	Applied Chemistry	12.65	IIT(ISM) & Tata Steel (MoU)
10	CSIR(23)/2017-2018/520/AM	Study on Some Solution Methods of Vector Optimization Problems.	Dr. Anurag Jayswal, Asstt. Professor	Applied Mathematics	5.87	CSIR
11	CSIR(24)/2017-2018/521/CSE	WSN based Disaster and Environmental Monitoring System for Safety of Miners Working in Underground Coal Mines.	Dr. Chiranjeev Kumar, Associate Professor	Computer Science and Engineering	5.41	CSIR
12	CSIR(25)/2017-2018/522/AM	Study of Wave Propagation Aspects in Piezoelectric, Piezomagnetic and Functionally Graded Piezoelectric Composite Structures.	Dr. Abhishek Kr. Singh, Asstt. Professor	Applied Mathematics	5.87	CSIR
13	DST(SERB)/(171)/2017-2018/523/MEC H. ENGG	Development of New Strategy to Enhance Cylindrical Wire Electrical Discharge Turning Process.	Dr. Amitava Mandal, Asstt. Professor .	Mechanical Engineering	33.61	DST (SERB)
14	DST(SERB)/(172)/2017-2018/524/CSE	Precision Agriculture Model to Increase Crop Productivity in India using Big Data.	Dr. Dharavath Ramesh, Asstt. Professor	Computer Science and Engineering	18.13	DST (SERB)

15	CSIR(26)/2017-2018/ 525/AC	Titanate Nanosheet/Cationically Modified Dextrin Through in-situ Exfoliation: Development and Application Towards Enhanced Dye Adsorption and Photodegradation Property.	Dr. Sagar Pal, Associate Professor	Applied Chemistry	11.00	CSIR
16	DST(SERB)/(173)/2017-2018/526/ESE	Design and Development of Full Solar Spectrum Enriched Photocatalyst for Sustainable Water Treatment.	Dr. Saravanan Pichiah, Asstt. Professor	Environmental Science and Engineering	15.40	DST (SERB)
17	DST(SERB)/(174)/2017-2018/527/CIVIL ENGG	Dynamic Crack Kinking from Aggregate-Mortar Interface of Concrete Sub-Structural System.	Dr. S Chakraborty, Asstt. Professor	Civil Engineering	28.70	DST (SERB)
18	NBHM/2017-2018/528/AM	Mathematical Modelling of Elastic Wave Propagation in Highly Anisotropic and Heterogeneous Media.	Dr. Abhishek Kr. Singh, Asstt. Professor Dr. Sanjeev Anand, Asstt. Professor	Applied Mathematics	14.38	NBHM
19	DST(SERB)/(175)/2017-2018/529/AC	Synthesis and Catalytic Investigation Towards H ₂ Evolution by 1 st Row Transition Metal Based Molecular Catalysts.	Dr. Sumanta K. Padhi, Asstt. Professor	Applied Chemistry	28.99	DST (SERB)
20	DST(SERB)/(176)/2017-2018/530/AGP	A Seismic Transect Across Northeastern India Beneath the Shillong Plateau.	Dr. Mohit Agrawal, Asstt. Professor	Applied Geophysics	43.05	DST (SERB)
21	DRDO(8)/2017-2018/531/CIVIL ENGG.	Comprehensive Study on Effect of High Temperature on Concrete Structure Related to the Lining of Curved Structure such as Tunnel.	Prof. Sekhar Ch. Dutta Dr. Virendra Kumar, Asstt. Professor, NIT, Jamshedpur, Dept. of Civil Engg.	Civil Engineering	9.75	DRDO
22	DST(SERB)/(177)/2017-2018/532/AM	Mathematical Modelling of Seismic Wave Propagation in Composite Layered Structures.	Prof. A Chattopadhyay Dr. Abhishek Kr. Singh,	Applied Mathematics	15.19	DST (SERB)
23	DST(SERB)/(178)/2017-2018/533/MECH. ENGG.	Development of modular type high speed ultra-precision machining center.	Dr. Vivek Bajpai, Asstt. Professor	Mechanical Engineering	35.16	DST (SERB)
24	ARDB(MoD)/2017-2018/534/MECH. ENGG.	Experimental Investigation on the Heat Transfer Enhancement of Hybrid nano-fluids in a plate heat exchanger.	Dr. Subrata Kr. Ghosh, Asstt. Professor	Mechanical Engineering	20.53	ARDB (MoD)
25	Tata Steel/2017-2018/535/ESE	Study to Develop & Improve Nitrification in AIS (Advent Integral System) at BOT Plant	Prof. S. K. Gupta Dr. Alok Sinha, Associate Professor & Dr. B. K. Mishra, Asstt. Professor,	Environmental Science and Engineering	11.50	TATA STEEL
26	DST(SERB)/(179)/2017-2018/536/AGL	Possible Hadean to Archaean Crustal Evolution in the Singhbhum Craton: An Investigation into the Detrital Zircon Archive.	Dr. Sukanta Dey, Associate Professor	Applied Geology	41.00	DST (SERB)
27	MOM(17)/2017-18/537/ME	Development of Environment Friendly Blasting Techniques.	Dr. B. S. Choudhary, Assistant Professor Prof. A. K. Mishra,	Mining Engineering	29.04	MoM

28	ISRO(8)/2017-2018/538/ECE	Design and Development of Substrate Integrated Waveguide (SIW) Based Circular Polarized High Gain Slot Array Antenna for Satellite Communication.	Dr. Santanu Dwari, Asstt. Professor Dr. Sushrut Das, Associate Professor	Electronics Engineering	18.20	ISRO
29	CIL(8)/2017-2018/539/CHEMICAL ENGG.	High ash coal gasification and associated upstream and downstream processes (Coal to Chemicals - CTC).	Prof. I. M. Mishra Prof. V.K Saxena Prof. D.D Pathak Prof. A K Varma Prof. Vineet Kumar Prof. Ashok Khanna Dr. A K Samanta Dr Suresh K Yatirajula Dr. A K Prasad Dr. Alok Sinha Dr. B.K Mishra Dr. Pankaj Mishra Dr. Suman Dutta Dr. K Sandilya Durbha Dr. S K Bhaumik Dr. S Sengupta	Chemical Engineering	1872.00	CIL
30	CIL(9)/2017-2018/540/ME	Development of Virtual Reality Mine Simulator (VRMS) for improving safety and productivity in coal mines.	Prof. V. M. S. R. Murthy	Mining Engineering	1320.10	CIL
31	ISRO(9)/2017-2018/541/AM	Predicting Reliability and Optimal Release Time of Various Categories Software Systems.	Dr. S Chatterjee, Associate Professor	Applied Mathematics	16.48	ISRO
32	DST(SERB)/(180)/2017-2018/542/ECE	Analysis of Phonocardiogram (PCG) Signal for Classification of Heart Valve Disease.	Dr. Sumitra Shukla, Post Doctoral Fellow	Electronics Engineering	9.60	DST (SERB)
33	MoES(12)/2017-2018/543/PE	Development and Characterization of Efficient Drilling Fluid Systems to Explore Huge Natural Gas Hydrate Resource in the Offshore of India.	Dr. Ajay Mandal, Assoc. Professor Prof. Sukumar Laik	Petroleum Engineering	42.77	MoES
34	DST(RFBR)/(181)/2017-2018/544/AM	Approach for the Processing of Data of Vibro-seismic Waves Records and Theoretical Investigations on Seismic Waves.	Dr. Santimoy Kundu, Asstt. Professor	Applied Mathematics	14.22	DST (RFBR)
35	IRS, ONGC & IIT(ISM)/2017-2018/545/PE	Development of Polymer Nano-composite Hydrogel Systems for Water Control in Oil/Gas Wells Completed in Harsh Environment.	Dr. Keka Ojha, Associate Professor	Petroleum Engineering	45.40	IRS, ONGC & IIT(ISM)
36	DST(182)/2017-2018/546/MS	Designing a Model for Measuring Entrepreneurial Drive of Active and Prospective Entrepreneurs with Science & Technology (S&T) Background in Jharkhand.	Dr. Niladri Das, Asstt. Professor Prof. J. K. Pattanayak	Management Studies	18.15	DST
37	DST(183)/2017-2018/547/ME	4 Days Training Programme on Application for Numerical Simulation for Slope stability Risk Mitigation and Management.	Dr. A.K.Verma, Asstt. Professor	Mining Engineering	4.50	DST
38	MoT(1)/2017-2018/548/MS	Study of Living and Working Conditions of Artists of Tribal Paintings of Jharkhand.	Dr. Mrinalini Pandey, Asstt. Professor	Management Studies	11.92	MoT

39	Tata Steel & IIT(ISM) - MoU/2017-2018/549/Instt.	Investigation on corrosion inhibition properties of nanostructures passivated zinc surface using surface Plasmon resonance and electrochemical impedance spectroscopy.	Dr. M Rakesh Singh, Asstt. Professor	Applied Physics	12.50	Tata Steel
40	DST-SERB/(184)/2017-2018/550/AC	Financial Support under National Post Doctoral Fellowship to Dr. Sumanta Sahoo under the mentorship of Dr. Ganesh Chandra Nayak,	Dr. G. C. Nayak, Asstt. Professor	Applied Chemistry	19.20	DST (SERB)
41	DST-SERB/(185)/2017-2018/551/AM	The Kontorovich-Lebedev Transform and Related Integral Operators on Function and Distribution Spaces.	Dr. Akhilesh Prasad, Associate Professor	Applied Mathematics	15.79	DST (SERB)
42	IUSSTF/2017-2018/552/AC	2D Nanomaterials for Energy Storage.	Dr. G. C. Nayak, Asstt. Professor	Applied Chemistry	30.25	IUSS&TF
43	DST-SERB/(186)/2017-2018/553/AC	Extraction of Nanocellulose from Waste Paper for Production of Biodegradable, Flexible and Cheaper Electrodes for Energy Storage Devices	Dr. G. C. Nayak, Asstt. Professor	Applied Chemistry	36.69	DST (SERB)
44	DST-SERB/(187)/2017-2018/554/AP	Electron and Positron Induced Chemistry at the Molecular Level Investigation Through Scattering Studies	Dr. Bobby Antony, Associate Professor	Applied Physics	23.34	DST (SERB)
45	DST-SERB/(188)/2017-2018/555/AP	Development of Surface Plasmon Resonance Ellipsometry as Label-free Optical Biosensor for Ultrasensitive Detection of Chemical and Biological Species	Dr. Moirangthem R. Singh, Asstt. Professor	Applied Physics	37.06	DST (SERB)