

*Office of the Dean
(Research and Development)
IIT(ISM) Dhanbad*



**R&D Brochure
(2024-25)**



Legacy that Inspires the Future

IIT(ISM) DHANBAD
Jharkhand, India-826004

[www.https://people.iitism.ac.in/~research/](https://people.iitism.ac.in/~research/)



MESSAGE FROM THE DIRECTOR



Indian Institute of Technology (Indian School of Mines), Dhanbad is one of the premier institutions in India, which is actively engaged in developing cutting-edge technologies and state-of-the-art research facilities. IIT(ISM) Dhanbad has nearly 100 years of legacy in teaching and research which makes it one of the most sought-after IITs among undergraduate, postgraduate and doctoral students. At IIT(ISM) Dhanbad, we have a cosmopolitan culture and our faculty members are from world-renowned institutions. As a result, IIT(ISM) Dhanbad has developed a niche in fundamental and applied research pertinent to societal and industrial needs. Indeed, several state-of-the-art technologies and services offered by our faculty members are being used in esteemed organizations such as Coal India Limited, TATA Steel, DRDO, L&T, etc. In the last couple of years, we have created world-class research infrastructure and facilities to cater to our nation short and long-term research goals. I wholeheartedly welcome funding agencies and companies to become part of the IIT(ISM) Dhanbad fraternity by using our expertise & facilities to develop indigenous technologies and help us to fulfill the vision of “Make in India”.

Best regards,

Prof. Sukumar Mishra
Director
IIT(ISM) Dhanbad



MESSAGE OF DEAN (RESEARCH & DEVELOPMENT)

Greetings from the office of the Dean (Research and Development), IIT(ISM) Dhanbad. The office of the Dean R&D primarily deals with strategic planning, creating research infrastructure, and fostering new and interdisciplinary research initiatives and collaborations. We strive to build strong collaborations with the Industry/Academia/PSUs to fulfil their fundamental and applied research needs. Indeed, the institute has strong industry collaborations, establishing several Centres of Excellence (CoE) at IIT(ISM) Dhanbad.

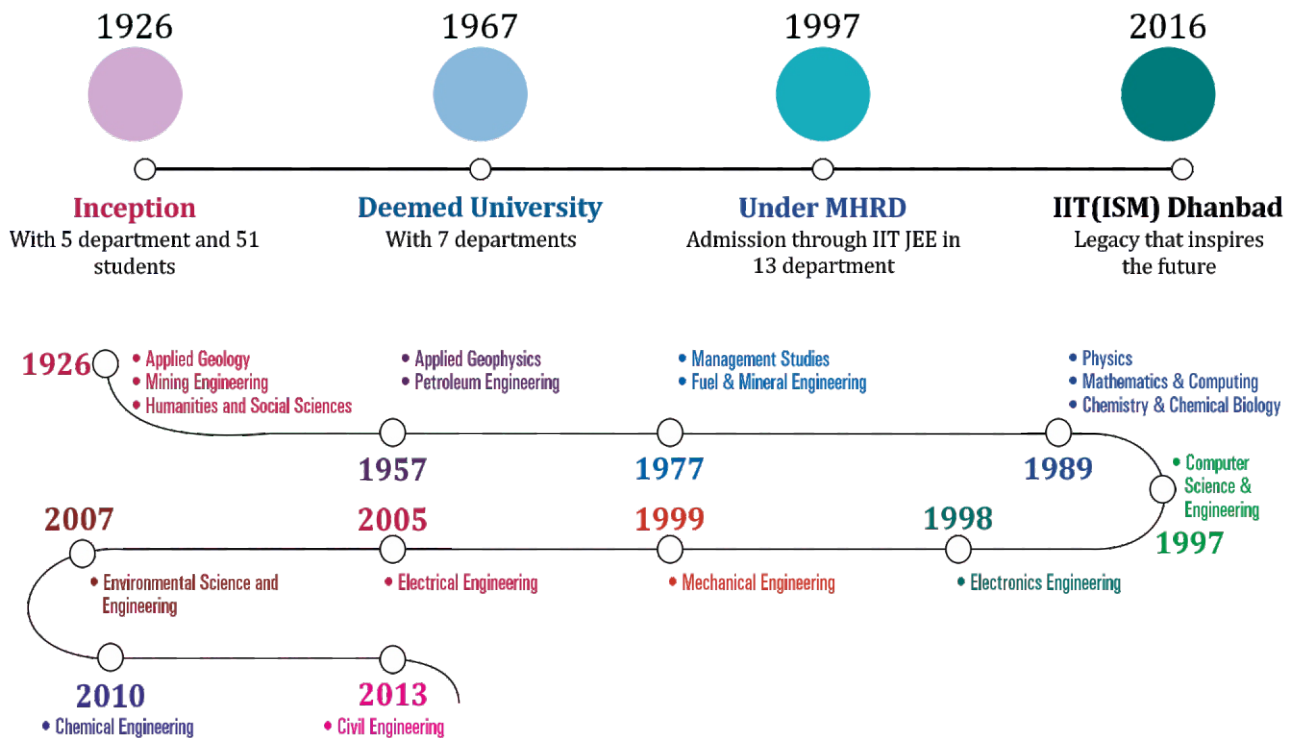
At present, IIT(ISM) Dhanbad has 17 departments and several centres, which are equipped with all necessary infrastructure and world-class faculties to undertake all kinds of fundamental and applied research problems. I am pleased to share that IIT(ISM) Dhanbad has been placed 41st in the QS Global University Rankings in Engineering - Mineral & Mining. I am confident that, with the help of our colleagues/students, we will make this Institute a Global Leader in the field of industrial and applied research.

I invite you to join our journey by utilizing our expertise, intellectual property, and research infrastructure to develop technologies pertinent to your organization.

Prof. Sagar Pal
Dean (R&D)
IIT(ISM) Dhanbad

IIT(ISM) at a Glance

• 12 UG Programs • 30 PG programs • ~7200 Students • 385+ Faculty members



Indian Institute of Technology (Indian School of Mines), Dhanbad was established on 9th December 1926 by the British Government of India. The institute was formally inaugurated by His Excellency the Viceroy Lord Irwin on the model of Royal School of Mines, London. The highest quality of education imparted to the Graduates, Post Graduates and Research Scholars help them prepare to tackle all challenges and perform well in industries across the world.

Initially started as an institution to impart mining education, has now graduated into a full-fledged premier institution of international acclaim offering a host of programs such as B.Tech, Dual Degree, Integrated M.Tech, Double Major, Minor, M.Tech, MSc Tech, MSc. and MBA. In addition, the institute also offers a full as well as part-time PhD. Programs and post-Doctoral fellowship.

41st

Globally (Engineering-Mineral & Mining) in QS World University Rankings in 2024

17th

Rank by NIRF in Engineering in 2023

Office of the Dean (R&D)



The Office of the Dean (Research and Development) drives Strategic planning and provide guidance across academic and research programs, fostering new and interdisciplinary research initiatives and collaborations. Represents institute for external R&D funding agencies.

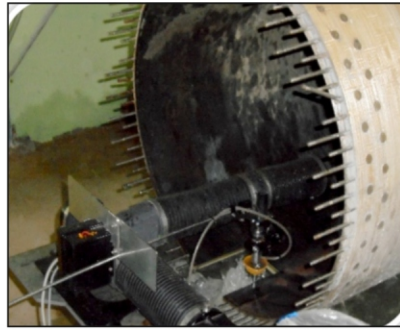
Our major role is to:

- Interlink Research and Industries with government policies such as: Make in India, Clean India, Aatma Nirbhar Bharat, Smart City initiatives and so on.
- Real time progress monitoring of Sponsored Projects & consultancies.
- Establishment of Industry Sponsored CoEs.
- Development of State-of-the-Art Research Infrastructure.
- Develop key research areas to establish the R&D strategy.
- Build strong Industry connections to establish Industry-Academia collaborations

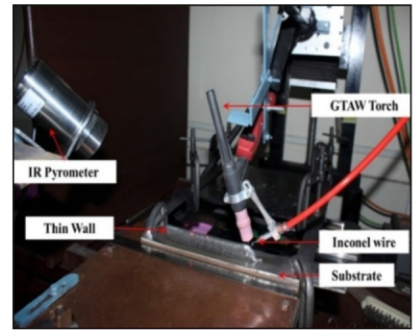
Major Technologies & Products Developed



Hybrid Micro Machining Technology using μ -ECM and μ -EDM Processes



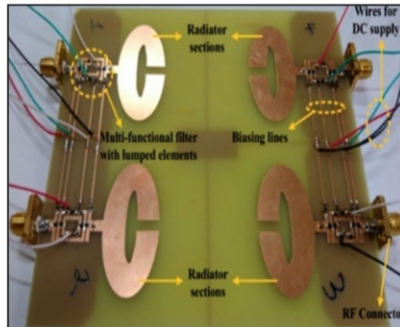
Equipment for Cutting of Composite Hardware (used Canister)



Direct Energy Deposition Facility



Self Advancing (Mobile) Goaf Edge Supports (SAGES)



4-Port MIMO CR System



MEMS DRA with Wideband and High Gain capability



High Power Handling Dielectric Resonator Antenna



Hybrid Charging System for E-Vehicles

Department of Chemistry & Chemical Biology, IIT(ISM) Dhanbad and Tokyo Chemical Industry Co, Ltd. Japan have signed a MOU on Material Transfer Agreement (MTA) for fine & specialty chemical products.



Distinctive Centres



**Tata Steel Innovation Centre
on Mining & Mineral Research
(23.15 Crore)**



**CIL Innovation Centre
(10.00 Crore)**

**Naresh Vashist Centre for
Hydrogen & CCUS Technologies
(10.00 Crore)**



**Naresh Vashisht Centre for
Tinkering and Innovation (NVCTI)
(08.00 Crore)**

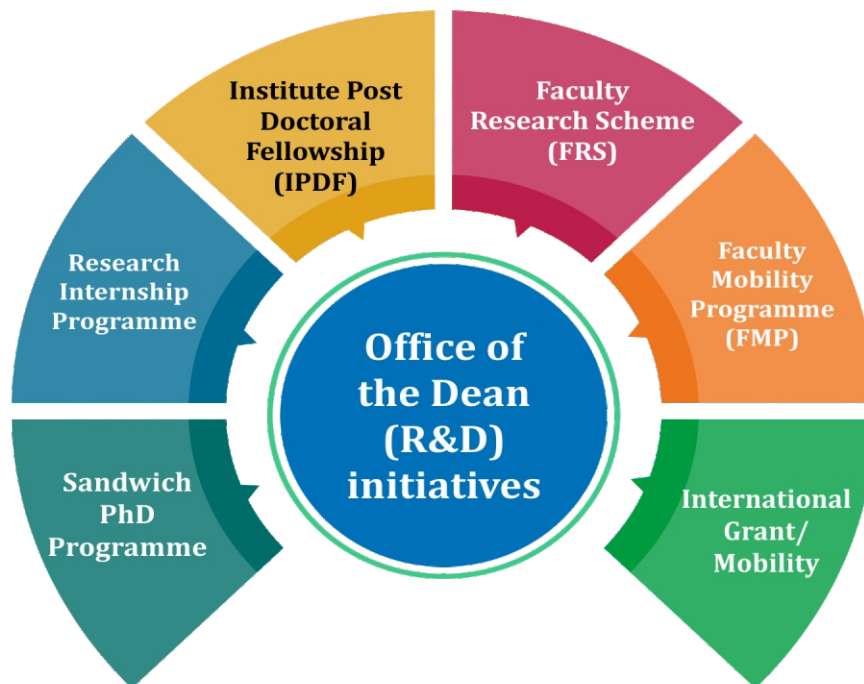


**Centre for Environmental
Information, Awareness, Capacity
Building and Livelihood
Programme (EIACP) (2.5 Crore)**



**Centre of Excellence
by Ministry of Tribal Affairs,
Govt. of India (1.92 Crore)**

Major Initiatives



To induce a vibrant research environment on campus and to constantly advance the bounds of scholarship, innovation, and knowledge research, the R&D Cell has introduced several reformist schemes, accentuating strong support for individual researchers. Besides, several research schemes have been introduced for the community to engage in high impact and leading-edge research within and across disciplines.

Central Research Facility (CRF)



HR TEM



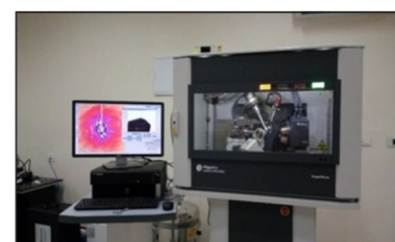
Lithography with FESEM



XPS



LIDAR



SC XRD

~Rs. 75 Crore Central Research Facility of IIT(ISM) Dhanbad has been established as a Centre of National Importance for Research and Creation. The constellation of high-quality equipment enabled with cutting edge technologies at a single location provides a scientific arena for the researchers. Sophisticated analytical instruments are vital for pursuing high-end research in areas of modern science and technology. Various advanced analytical instruments of CRF are operated and maintained by a dedicated and qualified group of Faculty members, Technical Officers and Skilled Operators. It is an integral part of IIT(ISM) Dhanbad.

Fabrication & 3D-Printing Facility

Rs. 5 Crore Fabrication & 3D-Printing Facility has been established at IIT (ISM) Dhanbad



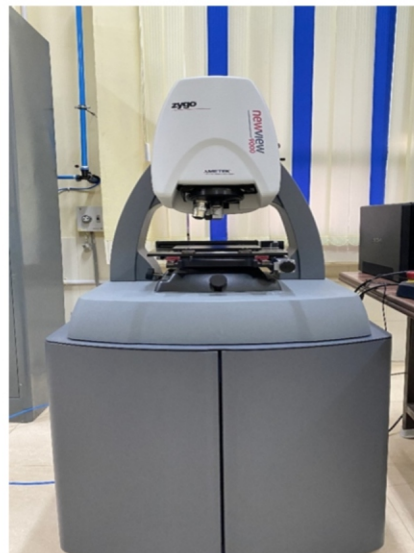
3D Ceramic Printer
(Nanoe)



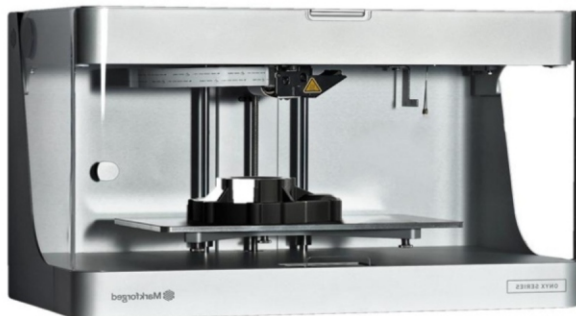
3D Metallic Printer (Flex 200)



3D Polymer Printer (Formlab 3)



3D Profilometer



3D Composite Printer (Markforge)

High Performance Computing Facility (HPC)

Rs. 10 Crore computing and software resources at IIT(ISM) Dhanbad has been established for Research purposes to cater growing and diversifying computing and data research needs.

CPU based cluster- 50 nodes, 2264 cores, 240 TB PSF Storage

GPU based cluster-NVIDIA DGX-1, 40 cores, 8 x V100 GPUs, 256 GB RAM

Software Available



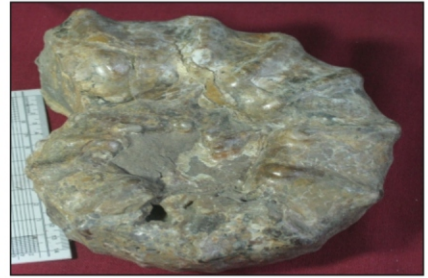
CHANDRASEKHAR



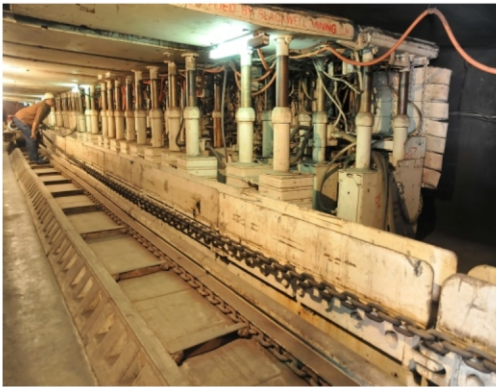
ARYABHATA

Geological Museum

The Department of Applied Geology, IIT(ISM) Dhanbad houses the oldest and richest Geological Museum among all the Indian Universities. It was established in July 1926 and houses about 12000 exhibits. It has separate galleries for rocks, minerals, gemstones, coal, hydrocarbon, structures, fossils, etc. This museum also housed a gallery having state-wise mineral resources from India.



Longwall Mine Gallery



An unique 30 Meter longwall mock gallery with Powered Support, Shearer, AFC, Stage Loader, Power Pack etc, a facility which is not available in any other institute in India

Seismological Observatory

Seismological Observatory at IIT(ISM) Dhanbad has been established to understanding earthquake-related phenomena and their effects through the development and application of innovative seismological research methods to build an earthquake-resilient society.



Panoramic view of observatory



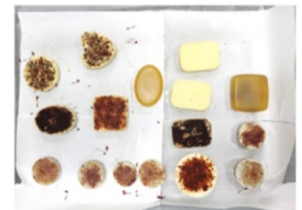
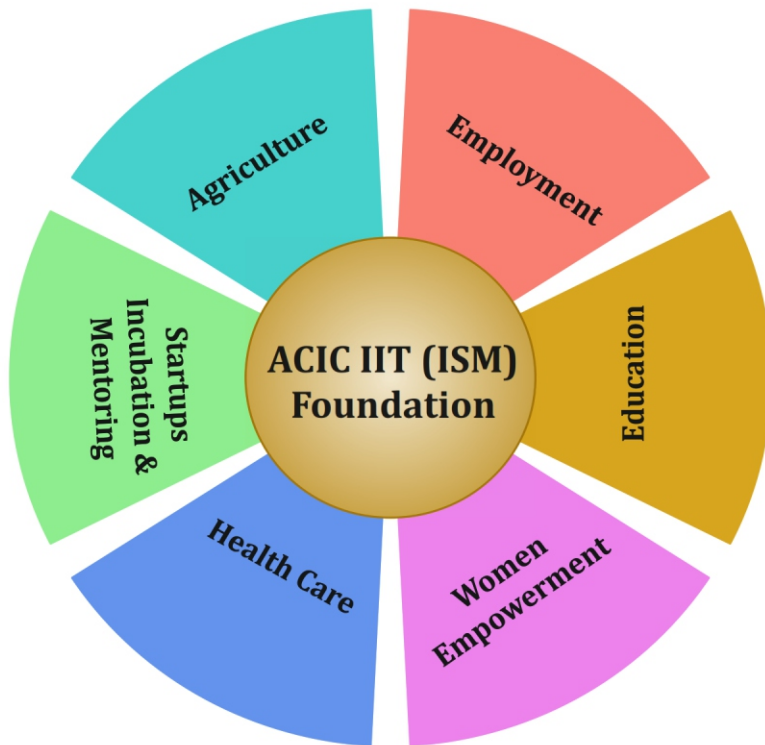
Data analysis room



Broadband, Analog and Short Period sensors installed on a concrete pillar

ACIC IIT(ISM) Foundation

ACIC is one of the entrepreneurial initiative of the Institute & Niti Aayog directed towards **community development**. The Objective of ACIC is: “for the community & by the community”



Startups Support

- Natural plant-based product development Division
- Rural Livelihood Laboratory
- Co-working space to our Start-ups
- Mentorship

Community Outreach

- Two projects have been launched to make the ball pin hammer and Chisel at Bhendra tools cluster competitive to the market
- Working on a project with SBI Life to uplift the living condition and Education of children

Skill Development Programs

- Training on Jute products
- Workshop on Lac Scrapping
- Workshop on organic Products
- Seminars & BootCamps

NVCTI (Naresh Vashisht Centre for Tinkering and Innovation)

Centre Highlights

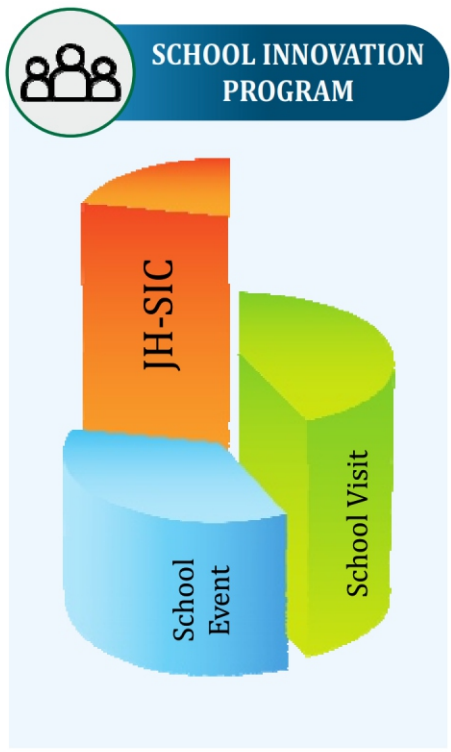
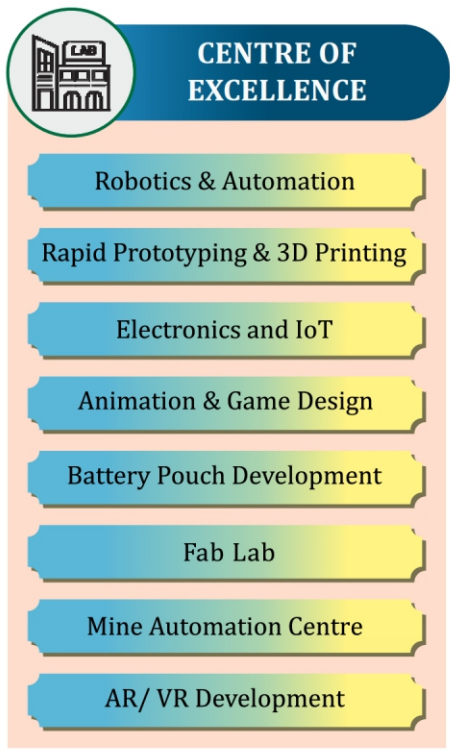
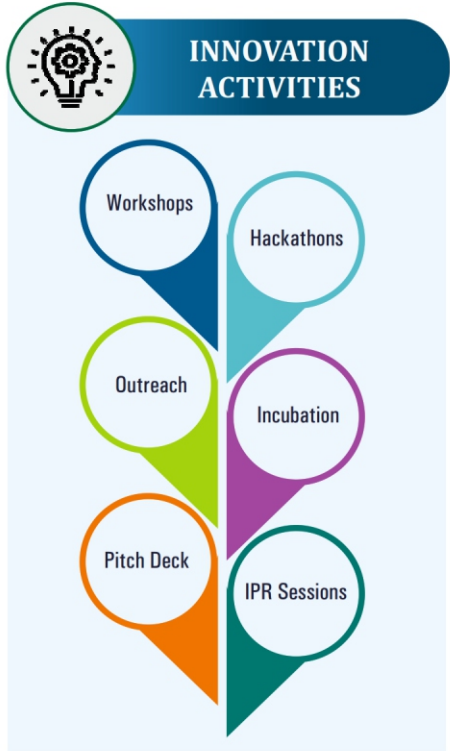
- ▶ NVCTI - IIT (ISM) Dhanbad has been initiated by our distinguished Alumni and donor Shri Naresh Vashisht, and his generous contribution of 1 million dollars towards the welfare of society.
- ▶ The primary objective is to enhance the interdisciplinary skills of professionals and students across various sectors, including government organizations, academic institutions, and industry..
- ▶ Conceptualized to build a positive innovation ecosystem and to provide a state of the art workspace to transform ideas into product leading to a successful entrepreneurship.
- ▶ Activities steered by an Innovation Council (IC) comprising Student Innovation Cell (SIC), Faculty Innovation Cell (FIC), and Invited members from industries/Alumni.

Facilities at NVCTI

- ▶ Electronics & IoT Facilities
- ▶ Advanced Rapid Prototyping & Manufacturing
- ▶ Industry Robotics & Automation
- ▶ Battery Manufacturing Unit
- ▶ AR/VR Gaming & Animation



NVCTI (Naresh Vashisht Centre for Tinkering and Innovation)



CNC Milling



Vertical Milling



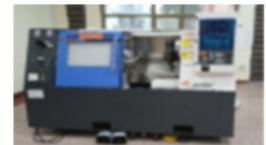
Lathe Machine



Battery Development



PCB Printing



CNC Lathe



3D Printing



Glove Box

State of Art Innovation & Tinkering Facilities

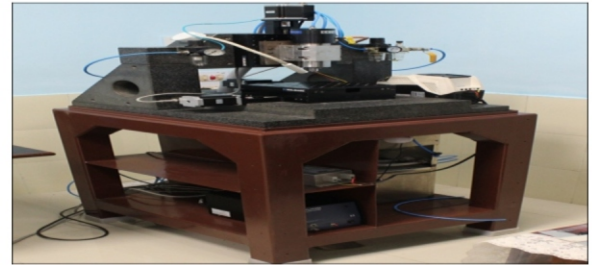
Technologies Developed



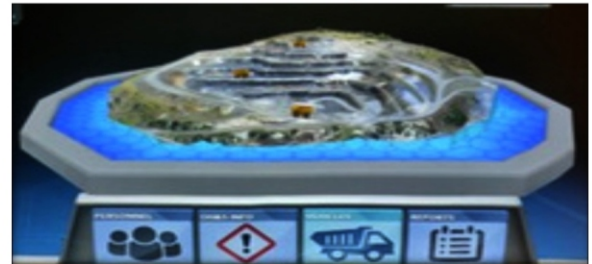
AI based Robotic Bionic Arm



Coal based Graphene Powder



Micromachining Centre



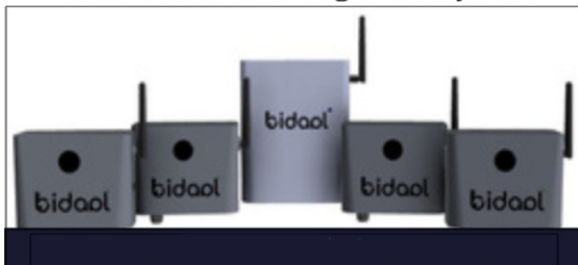
3D Hologram Data Visualization



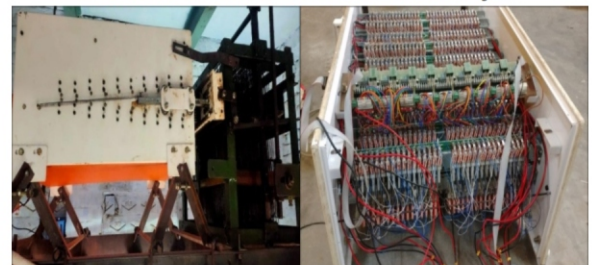
AI based traffic Management System



Smart Helmet for Mine Safety



IoT based smart Signaling System



Digital Punch Card



AI-enabled solar-based street lighting system



Rapid Organic Waste Stabilizer

CIL Innovation & Incubation Centre



**CIL Innovation &
Incubation Centre**

CIL INNOVATION & INCUBATION CENTRE



IIT(ISM) DHANBAD

CIL Innovation & Incubation Centre

Start-ups pre-incubated under CIL Centre

Pinacle Depth Mine Management & Services Pvt Ltd

Title of Project : Electronic Borehole Compass - An indigenous device to determine the borehole trajectory



Spire Viz Pvt Ltd

Title of Project : 360-Degree Mine Simulator

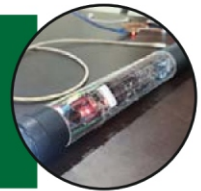


Joymettec Pvt. Ltd.

Title of Project : MinoVR – Mine to Meta

Geo Lib Pvt. Ltd.

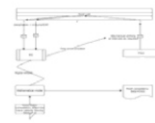
Title of Project : Design and Development of an automated borehole televiewer



Ongoing Projects



Prevention of coal pilferage in mining using AI & IOT and development of mechanical sampler



Automation in UG mines roof competency (strength) test



Development of Cost - Effective Data Acquisition System



Day to day tracking of human resources for entry and exit out of UG mines



Development of electronic Clar Compass



Health ATM



Payload monitoring of loading equipment (Shovel / Excavators) displayed in the operator's cabin



Instrumented Rock-bolt Extensometer Load measuring devices

CII Innovation & Incubation Centre



Microsoft for Startups

- ▶ Up to \$150,000 Azure credits to the start-ups of CII Centre
- ▶ Mentorship from business leaders and technical experts all around the globe
- ▶ GitHub and Visual Studio Core for developer collaboration
- ▶ Powerful development and productivity tools including Microsoft
- ▶ CII Centre may use Microsoft logo in his partner offerings to the start-ups and start-up program related social media announcements.



- ▶ SIPL will provide fund to IIT(ISM) Dhanbad for development of Industry 4.0 platform in CII Centre

Focus area

- ▶ Application of Industry 4.0 (IOT, AI, Big data analytics, cloud computing etc.) for machine failure analysis, predictive maintenance of HEMM, SMP, environmental monitoring and control, coal quality analysis, auto-evaluation of tender, enhancing availability and utilization of HEMM, etc.
- ▶ Augmented Reality for training remote maintenance of plant and machine, risk identification and risk assessment, performing mock rehearsals, mine simulation, etc.



Amazon Web Services

- ▶ \$50,000 in Aws Activate credits to the start-ups of CII Centre
- ▶ Mentorship from business leaders and technical experts all around the globe
- ▶ CII Centre is an AWS activate partner who can approve the benefits of the start-up's



NetApp

- ▶ Collaboration in the area of Storage, cloud computing, AI and Big data analytics
- ▶ Mentorship from business leaders and technical experts all around the globe
- ▶ NetApp India will help start-ups in arranging the funds by connecting them to the VC's.

TEXMiN (Technology Innovation Hub)



TIH at IIT (ISM): Technology Vertical 'Technologies for Mining'
(Exploration & Mining- Technology Innovation in Exploration & Mining Foundation
- TEXMiN - A Section 8 Company.

Mining 4.0

Mining Technology Innovation Hub

Digitization and Digitalization of the Entire Mining Value Chain - **DIGITAL TRANSFORMATION**

The objective of TEXMiN is to achieve 3S Mining (Safe, Smart, and Sustainable Mining leading to Mining 4.0) through operation & process optimization across the mining value chain.

Covers

AI & ML
AUGMENTED REALITY
VIRTUAL REALITY
SMART SENSORS AND MINER'S TRACKING SYSTEMS
SMART AND INTELLIGENT SENSING SYSTEM
ROBOTIC MINERS SYSTEM
ENTERPRISE-BASED DECISION SUPPORT SYSTEMS
MINE DATA ANALYTICS

contect@texmin.in

Exploration 4.0

About TEXMiN

TEXMiN is a Technology Innovation Hub (TIH) under National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) is mandated to work on Cyber-Physical Systems in **Mining and Mineral Exploration Industry.**

Technology Development and R&D

Capacity Building, Skill Development

Innovation, Start-Up Ecosystem

International Collaborations

www.texmin.in

Office premises:
Institute Innovation Hub (i2h), IIT (ISM) Dhanbad

TEXMiN (Technology Innovation Hub)

Problem Statements source

Various Ministries

- Ministry of Mines
- Ministry of Coal
- Ministry of Telcom
- Ministry of Electronics and Information Technology

Our Clients



and many more...



TEXMiN IIT (ISM)

SME (Subject matter experts)

- Academic Institutes (15)
- Industry experts (100+)
- Inhouse experts

Our Collaborators



International collaboration



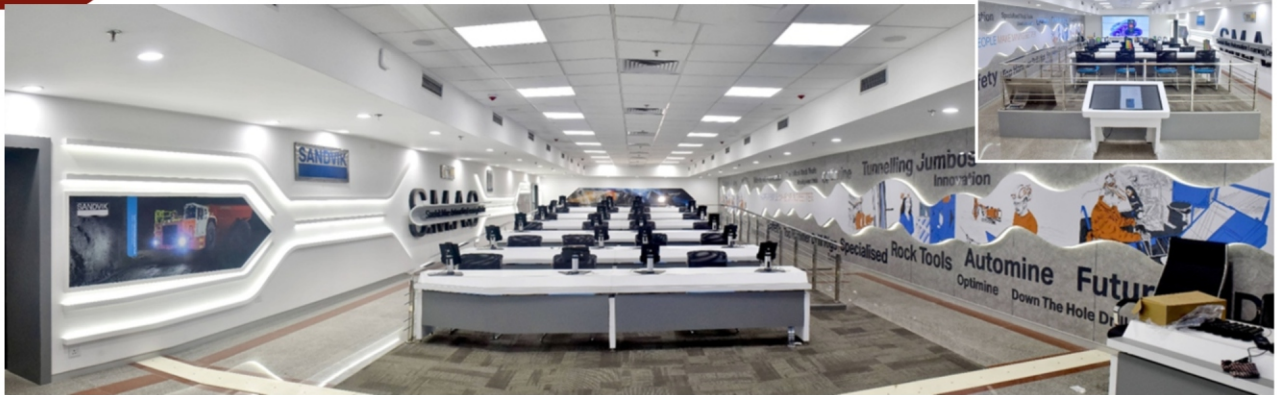
Solution Dev & Commercialization

Our Startups



Other Indian Startups

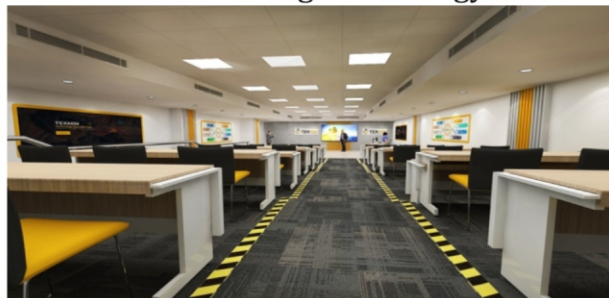
Centre of Excellence at TEXMiN



Sandvik Mine Automation Learning Centre (SMAC)



Mining Technology Excellence Centre – TEXMiN & Dassault



TEXMiN - Esri Geospatial Excellence Centre



TATA Innovation Centre for Mining & Mineral Research



Adani 3S Mining Excellence Centre



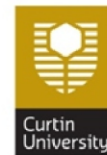
TEXMiN – Carlson Geodesy Centre

International Collaborations

IIT (ISM) Dhanbad is a part of Heritage Network, Indo-French Consortium, Finnish Universities Consortium and has collaborations with more than 20 Universities worldwide



POLITECNICO MILANO 1863



- MoU based Dual PhD Program
- Faculty Mobility Programme
- Sandwich PhD Programme

Campus Facilities



Computer Centre



Health centre



Central Library



Seismological Observatory



Penman Auditorium



Swimming Pool



Geological Museum



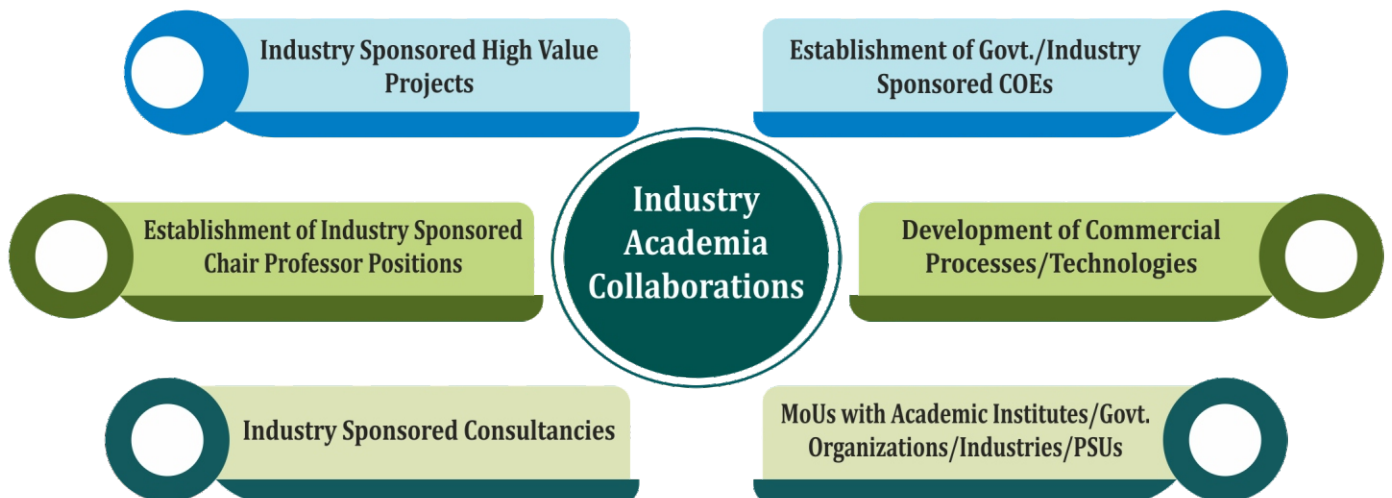
Sports Complex

Research & Innovation Infrastructure



The Institute is equipped with advanced analytical instruments, fabrication facilities, high performance computing facilities, several innovation and incubation centers.

What we are looking for?



Research at a Glance

R&D Projects

- ~250 Ongoing R&D Projects.
- ~ 150 Recently Completed R&D Projects.
- ~ 50 International Projects.
- Total Outlay of Ongoing R&D Projects:~150 Crore.

Both fundamental and applied research are being carried out at IIT(ISM) Dhanbad

Patents, Publications & Citations

- Total Publications: 16996 (Scopus); 10034 (WoS, 20 Years); 5719 (WoS, 5 Years).
- Total Citations: 230137 (Scopus); 165356 (WoS, 20 Years); 54817 (WoS, 5 Years).
- H-Index: 135 (Scopus); 123 (WoS).
- 198 Patents granted/filed in the last 5 years.

IIT(ISM) Dhanbad is 8th Rank amongst IITs in terms of No. of Publications available in Scopus database

Research Facilities

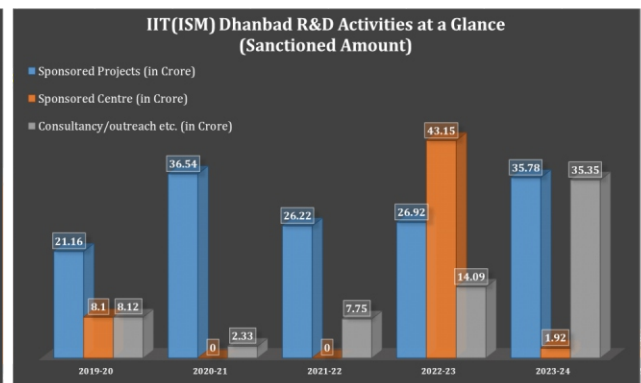
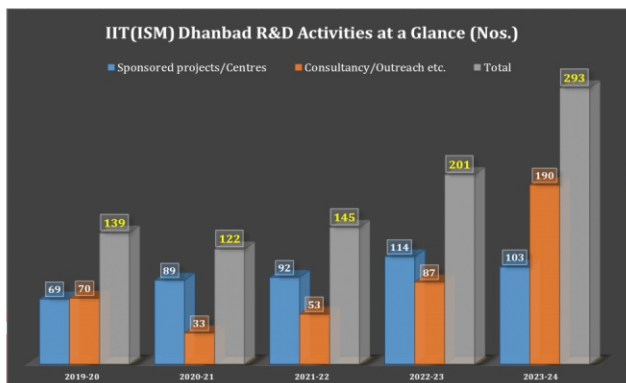
- State-of-the-Art Central Research Facility
- High Performance Computational Facilities
- Fabrication and 3D Printing facilities
- Departmental Research Facilities

IIT(ISM) Dhanbad has one of the best Research Infrastructural Facilities at the Eastern part of India. 1700+ state-of-the-art Instruments are listed at I-STEM portal.

Industrial Collaborations

- ~180 ongoing Industry Sponsored Consultancy Projects / Outreach Programmes
- 100+ Startups & 45+ Technologies developed and delivered.
- 3 Section-8 companies & 6 Sponsored Centres.
- Total Outlay of Ongoing Consultancy Projects: ~40 Crore.

100+ Industry Sponsors including ONGC, CIL, Reliance, Tata Steel, BRO, NBCC, SAIL, NTPC, Adani, Jindal etc.



Dean (R&D) Team



Prof. Sagar Pal

Dean (Research & Development)
Professor, Dept. of Chemistry & Chemical Biology
IIT(ISM)Dhanbad
Tel : +91-326-2235203, E-mail : drnd@iitism.ac.in
Web : <https://people.iitism.ac.in/~sagarpal/>



Prof. Sukha Ranjan Samadder

Associate Dean (Research & Development)
Professor, Deptt. of Environmental Science & Engineering
IIT(ISM)Dhanbad
E-mail : adrnd@iitism.ac.in
Web : <https://iitism.irins.org/profile/97661/>



Prof. Ejaz Ahmad

FC - SRIC
Assistant Professor, Deptt. of Chemical Engineering
IIT(ISM)Dhanbad
E-mail : fic_sric@iitism.ac.in
Web : <https://iitism.irins.org/profile/145028/>



Mr. Naveen Kumar

Assistant Registrar (Project Purchase & Stores)
IIT(ISM)Dhanbad, E-mail : arpps@iitism.ac.in



Mr. Kamesh Kanchan Katariar

Assistant Registrar (Project Accounts)
IIT(ISM)Dhanbad, E-mail : arproject@iitism.ac.in