

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



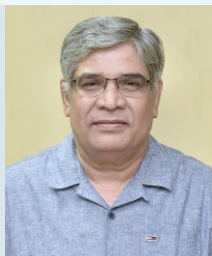
R&D Brochure
(2022- 23)



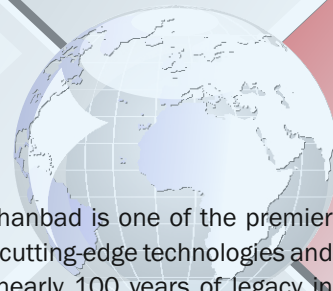
Legacy that Inspires the Future

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(Indian School of Mines), Dhanbad
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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. J. K. Pattanayak
officiating 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.

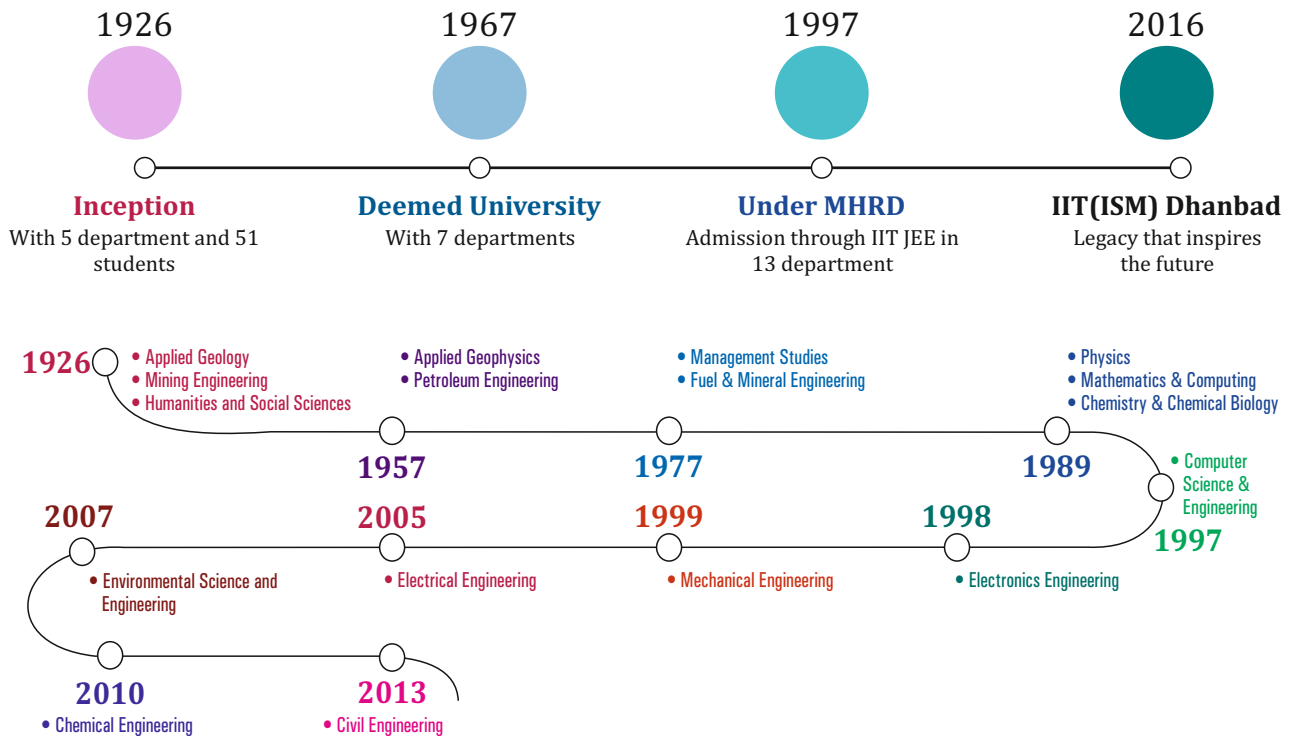
At present, IIT(ISM) Dhanbad has 17 departments and several centres, which are equipped with all necessary infrastructure and world-class faculties to undertake all kinds of fundamental and applied research problems. I am pleased to share that IIT(ISM) Dhanbad has been placed 25th in the QS Global University 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 • 20 PG programs • ~7350 Students • 358+ 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.

25th

Globally (Engineering-Mineral & Mining) in
QS World University Rankings in 2023

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.

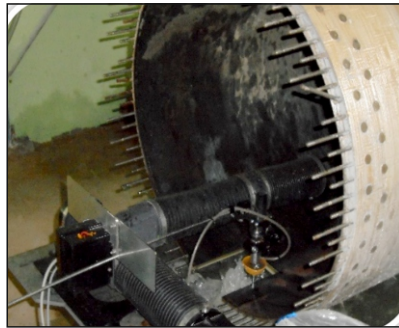
Our major role is to:

- 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

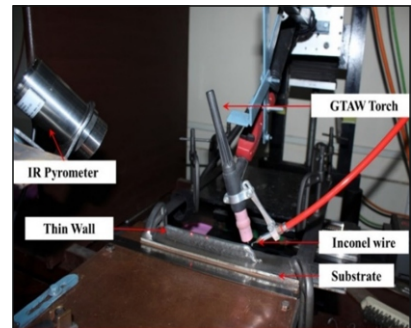
Major Technologies & Products Developed



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



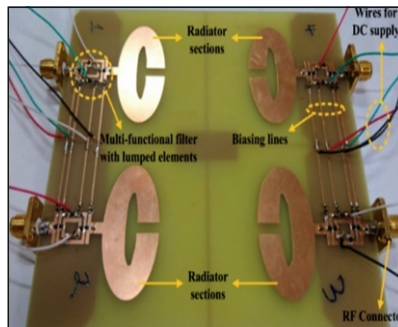
Equipment for Cutting of Composite Hardware (used Canister)



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)**



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



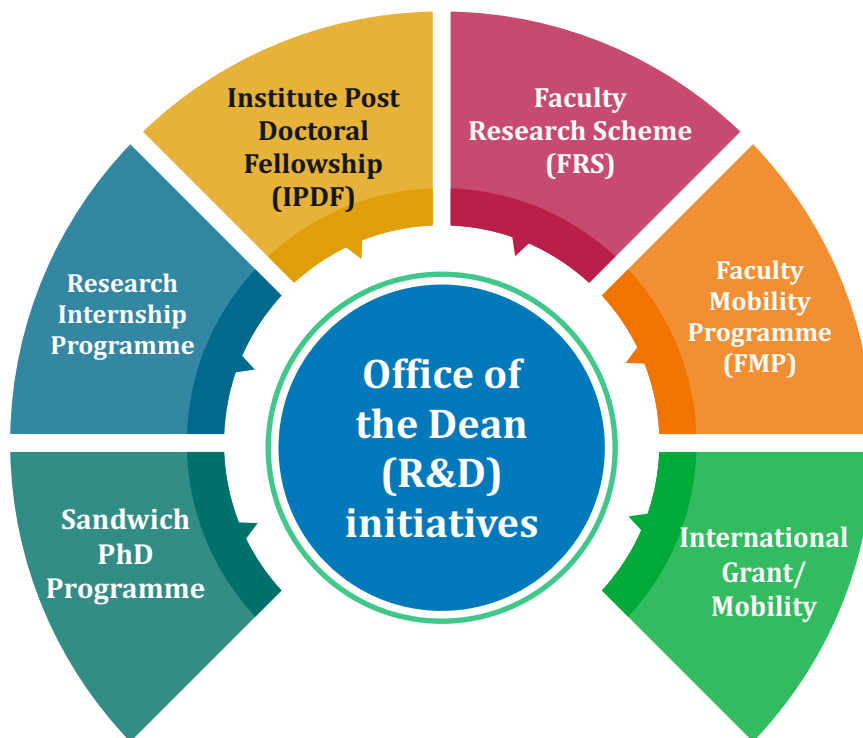
**CIL Innovation Centre
(10.00 Crore)**



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

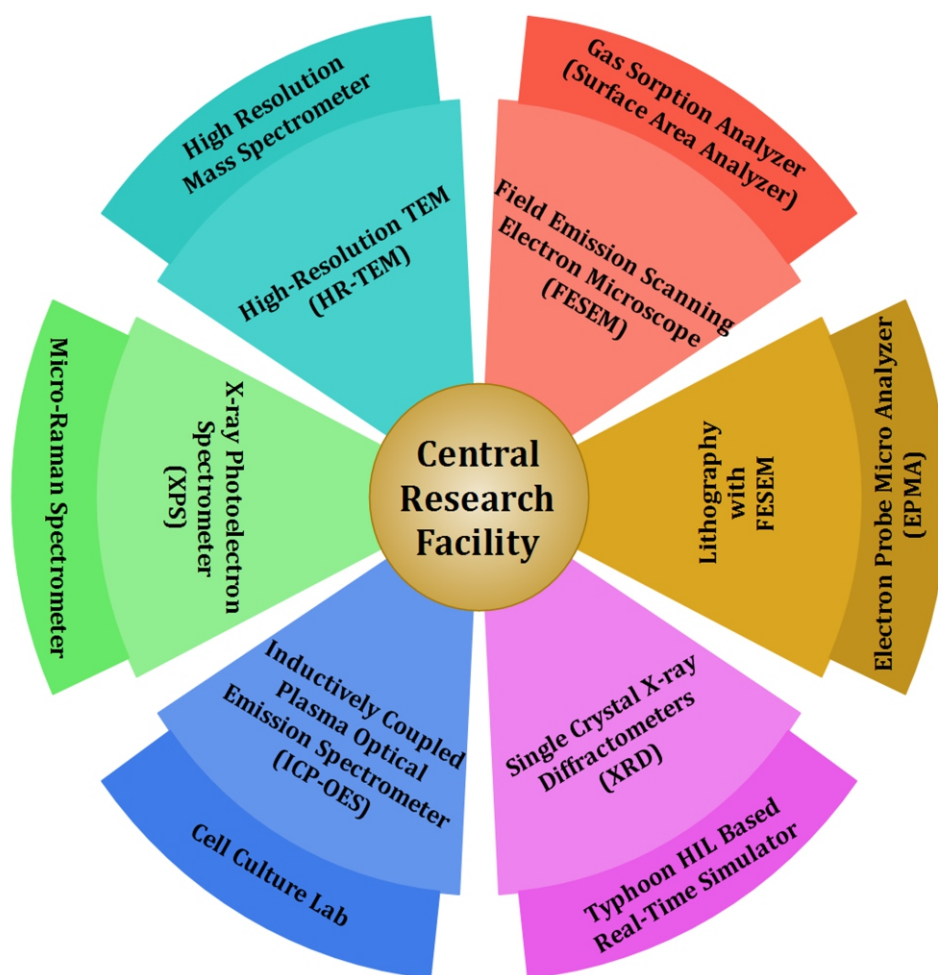


Major Initiatives



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)



~**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.



HR TEM



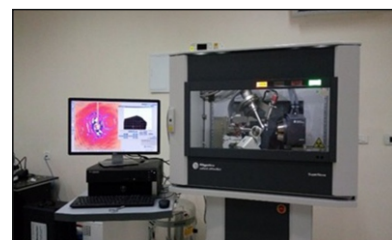
Lithography with FESEM



XPS



LIDAR



SC XRD

Fabrication & 3D-Printing Facility

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



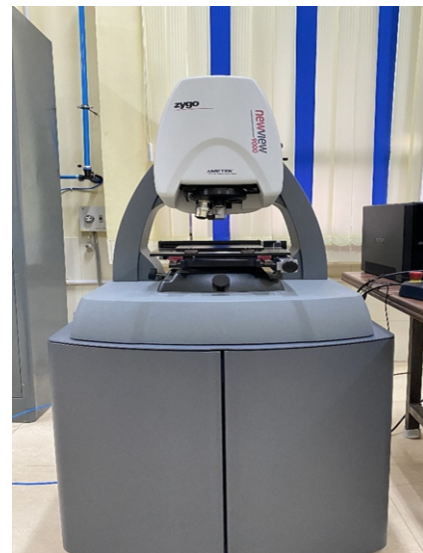
3D Ceramic Printer
(Nanoe)



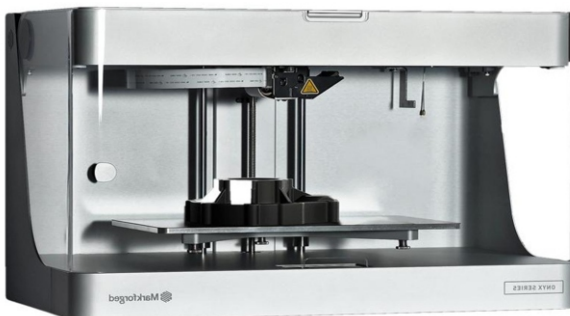
3D Metallic Printer (Flex 200)



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



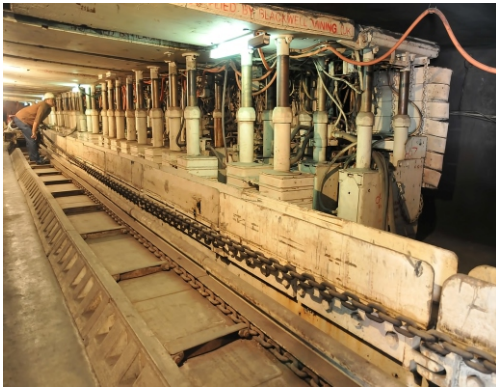
ARYABHATA

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



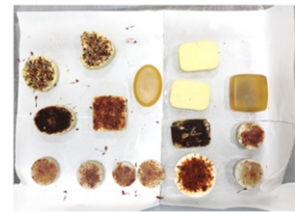
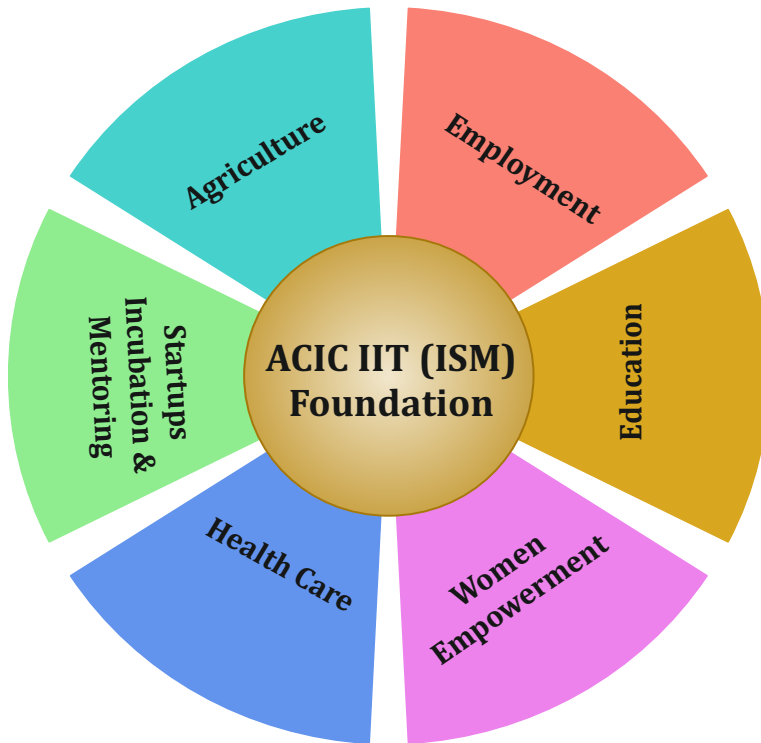
Data analysis room



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

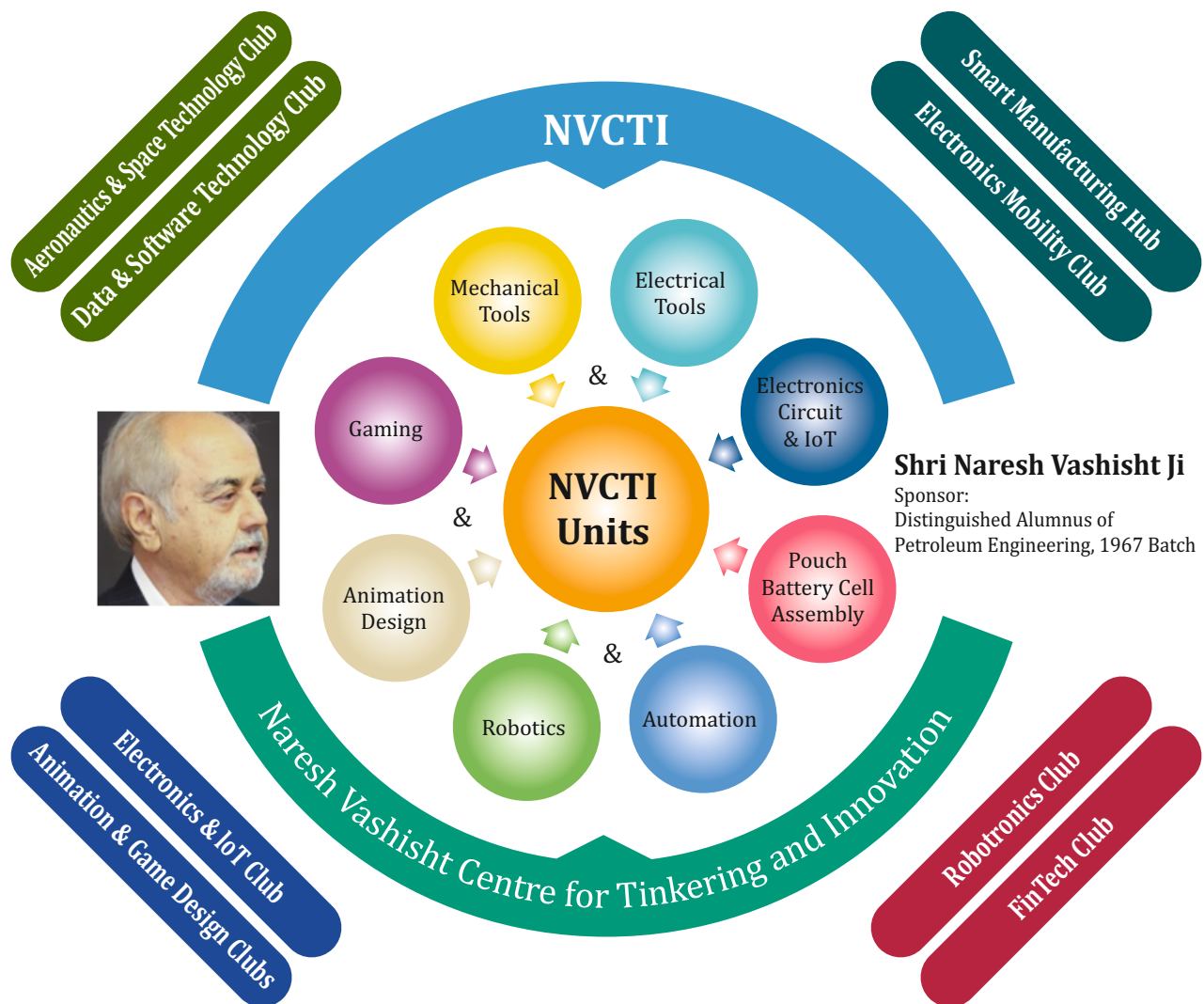
Skill Development Programs

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

Naresh Vashisht Centre for Tinkering and Innovation (NVCTI)

Centre Highlights

- 11000 Sq. ft. of New CRE building inside IIT (ISM) campus
- 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.



CIL Innovation & Incubation Centre



CII Centre was established on 2021-2022 in support of CIL within the boundaries of IIT (ISM) Dhanbad

Facilities

- Fab Lab /Makerspace
- Design Thinking Lab
- Mine Simulation / AR Lab
- Virtual Reality Lab
- Advance Rapid Prototyping Lab
- Mine Automation Lab
- Electronics and Sensor Lab
- Pre-Incubation/Incubation for Startups



Technical/Lab Facilities



Administration/
Secretarial Facilities



Advisory and
Mentoring Support



Network
Connections/Linkages



Fund Support



Infrastructure/Co-Working Space



Portfolio Support

TEXMiN (Technology Innovation Hub)



Highlights

National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), Department of Science & Technology (DST) : Established 25 TIHs

CPS : Cybernetics, Mechatronics, Design and Embedded systems, Internet of Things (IoT), Big Data, Artificial Intelligence (AI)

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

IIT (ISM) Dhanbad:

- Rich Mining ~100 years in Mining & Upstream Exploration Heritage
- Natural Resources Backdrop: East India Mining belt provides unparalleled Infrastructure
- Best of the class talent pool and research infrastructure



IIT(ISM) DHANBAD



Quoro Labs

- Developing the systems for the mining and material handling applications.
- Use to analyze and live tracking of the quality parameters of bulk materials.



Bidaal

- Working on traffic management in mines.
- Sensors which can be installed in the mines and give traffic warning when HEMMs are moving at an intersection.



Climate-B Ventures Pvt. Ltd.
Building Resilience. Empowering Enterprises.

Climate-B

- Climate risk assessment of large infrastructures, particularly mines.
- Developing flood modeling simulation in mines to mitigate risk of flooding in mines.



Incubig

- Using AI/ML algorithm, have created a software-as-a-service platform.
- Gives status of research being done in a company's domain.



Graphenera Carbon

- Graphene manufacturing and manufacturing of graphene-based products and its supply to the market



DeepMatrix

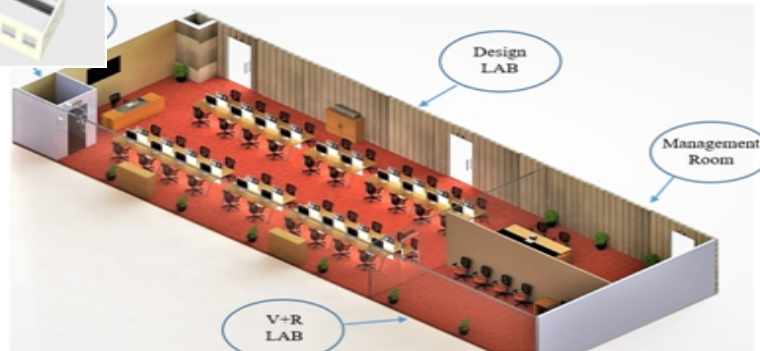
- Drone-based solutions
- Data management and analytics of massive Earth Observation data

Few other Startups in Pipeline for Incubation

Centre of Excellence at TEXMiN



- Sandvik Mine Automation Learning Centre (SMAC)
- Dassault Systemes - Mining Technology Excellence Centre in Mining & Allied Industries



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



- 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

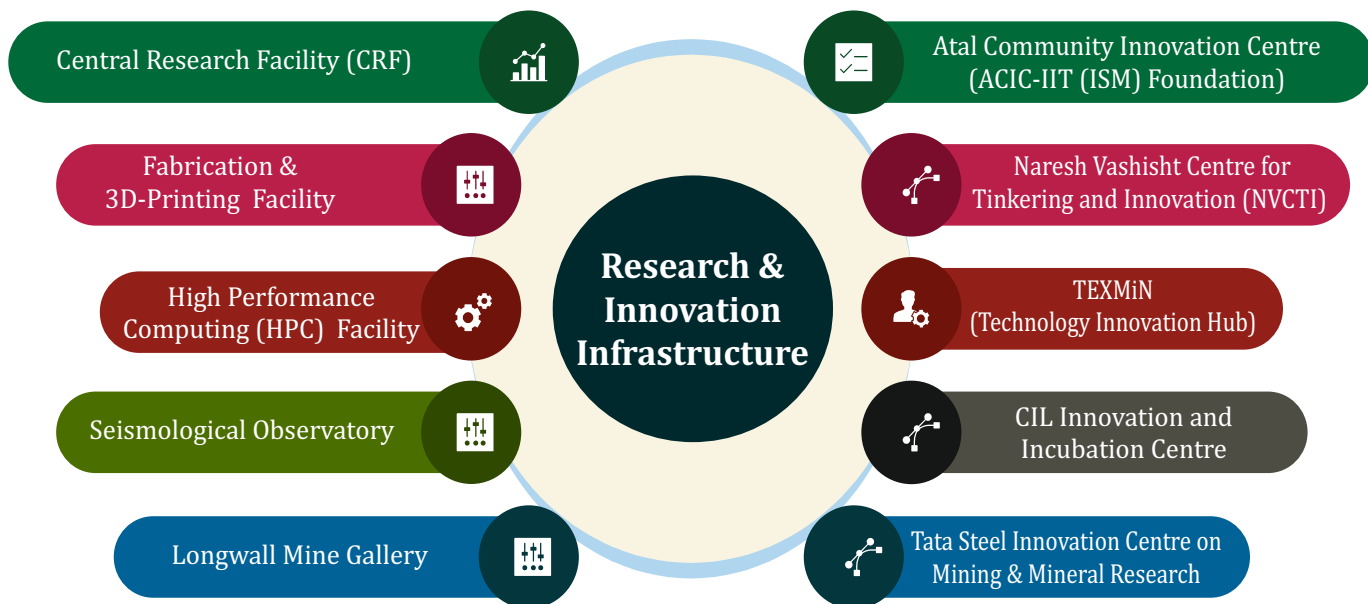


Geological Museum



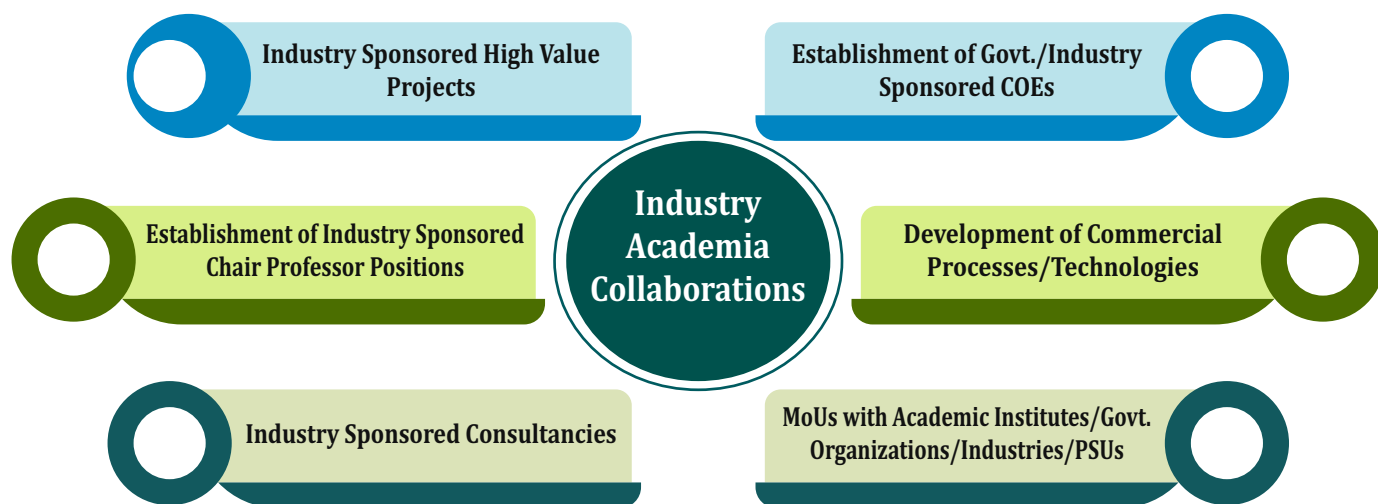
Sports Complex

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

- 240 Ongoing R&D Projects.
- ~ 125 Recently Completed R&D Projects.
- 48 International Projects.
- Total Outlay of Ongoing Projects:~190 Crore.

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

Patents, Publications & Citations

- Total Publications: 16339 (Scopus); 9585 (WoS, 20 Years); 5576 (WoS, 5 Years).
- Total Citations: 207514 (Scopus); 144307 (WoS, 20 Years); 62170 (WoS, 5 Years).
- H-Index: 130 (Scopus); 115 (WoS).
- 140 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 (~Rs. 75 Crores)
- 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.

1701 state-of-the-art Instruments are listed at **I-STEM portal**.

Industrial Collaborations

- 125 ongoing Industry Sponsored Consultancy Projects / EDP.
- 56 Startups & 45+ Technologies developed and delivered.
- 2 Section-8 companies & 2 Industry Sponsored CoEs.

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

Dean (R&D)Team



Prof. Sagar Pal

Dean (Research & Development)

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