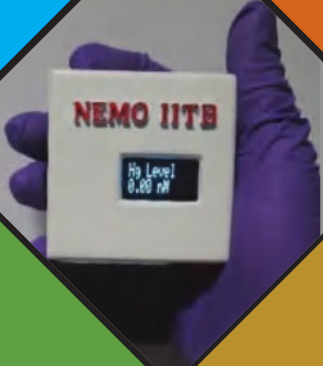




R & D Highlights

2023

Indian Institute of Technology Bombay



I am pleased to share with you that the Institute continues to be ranked as one of the top universities of the country and among the best in the world. It has also been recently declared as an 'Institution of Eminence' by the Ministry of Human Resource Development, GoI. IIT Bombay attracts the brightest students from the country for its Bachelor's, Master's and Doctoral programmes, and in the 60 years of its existence, close to 65,000 students have graduated from IIT Bombay.

IIT Bombay is in the midst of rapid and exciting change with three big trends: firstly, there has been very rapid growth in student numbers, secondly, the Institute has substantially expanded its postgraduate programmes and R&D activity and thirdly, there is a huge student interest in entrepreneurship with a vibrant startup ecosystem developing around the campus. The Institute continues to strive for excellence in its core activities of teaching and research in this milieu of change.

Research and development being the increasing focus of activity, the Institute is making strong efforts to see that the fruits of the research are translated into commerce through licensing and startups. The Institute has been able to attract outstanding faculty members from not just India but other parts of the globe. The Institute has set up several large multidisciplinary research centres to address complex problems in a holistic way involving researchers from different academic units. The Institute has also been able to further its links with international and national peer universities, enabling it to enhance its research and educational programmes.

The goal is to promote *research that makes a difference* - a difference to society, to industry and to the profession itself.



Prof Subhasis Chaudhuri
Director, IIT Bombay



IITB secures 1st position in India and 149th rank globally in QS World University Ranking 2024



IITB wins the National IP Awards 2023



Prof. R. Sunoj receives National Award to Teachers 2023



Director Prof. Subhasis Chaudhuri receives the award for NIRF Rankings 2023 as IITB secures 4th position for 'Overall' and 3rd 'Engineering' categories



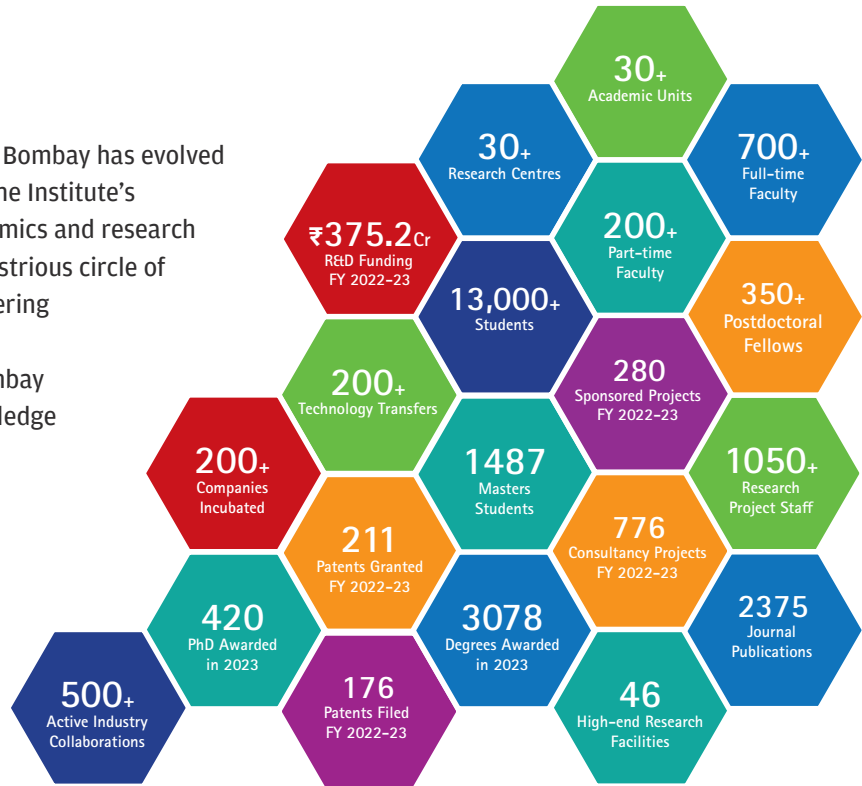
IITB Team SHUNYA wins the runners-up title for the prestigious US Solar Decathlon Build Challenge 2023



Prof. Amit Arora and team wins National Grand Onion Challenge 2023

IIT Bombay at a glance

Research and Development (R&D) at IIT Bombay has evolved and flourished over the decades since the Institute's inception in 1958. The synergy of academics and research has catapulted the Institute into the illustrious circle of world-class institutions. Apart from offering viable solutions to various government sectors, industry and to society, IIT Bombay pursues basic research leading to knowledge generation that lays the foundation for empowering India as a nation to be technologically confident and self-reliant.



R & D Funding

New R&D projects, both short term consulting and longer term sponsored research, are initiated every year in all the areas of science, engineering, management, design and social sciences. Duration of the projects typically ranges from 2-5 years. Funding received for R&D activity in **FY 2022-23** is **₹ 375.2 crores**. This includes grants received for newly sanctioned as well as ongoing projects.

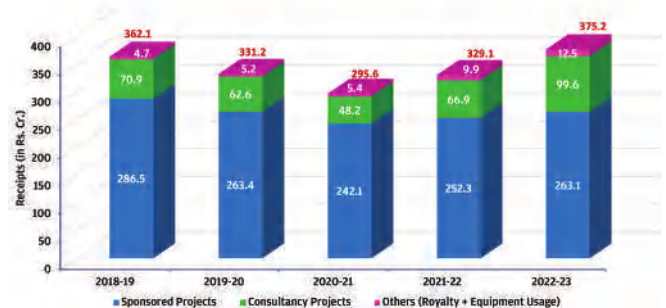
Intellectual Property

Period 1.1.1997 to 1.12.2023

- Patents filed (Indian + Foreign + PCT): 1376 + 228 + 142
- Patents granted (Indian + Foreign): 883 + 138
- Designs (Filed + Registered): 111 + 86
- Copyrights (Filed + Registered): 35 + 21
- Trademarks (Filed + Registered): 263 + 189

R & D Receipts

R&D Receipts (FY 2018-2023)

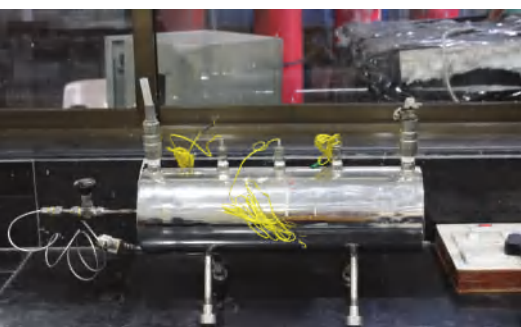


R&D Overview

IIT Bombay has made concerted efforts to align its R&D focus with the national goal of achieving technological self-reliance. Students and faculty members conduct research projects in all areas of science, engineering, design, management and humanities. The Institute has ongoing academic and research collaborations with many national and international universities, government institutions, PSUs and private industries. These interactions aim to keep pace with expanding frontiers of knowledge and global developments and also continually work towards national needs. Its pre-eminent position at the cutting-edge of research is reflected in its impressive list of research projects and their outcome.

Make in India Activities

Make in India is an initiative of the Govt. of India to encourage multinational and domestic companies to manufacture products in India. IIT Bombay has been working towards developing indigenous technologies and know-how with a focus on economy and efficiency. IIT Bombay has stepped up to impart R&D solutions to various sectors.



10kg metal hydride H₂ storage systems



Indigenous high energy Li-ion and sodium-ion batteries



End-to-end cell and gene therapy solutions to cure cancer

- **CAR-T cell therapy for cancer cure:** Long-term and low-cost novel indigenous gene therapy where the Chimeric Antigen Receptor-T cell genetically engineers the patient's 'own' immune cells to recognize and kill cancer cells; one of the most effective treatments for treating blood cancer; developed in collaboration with Tata Memorial Hospital
- **Indigenous development of high energy Li-ion and sodium-ion battery:** implementation of advanced and innovative approaches in the field of energy storage devices; prototyping of second-generation battery chemistries to bridge the gap between industry and academia
- **Metal hydride based hydrogen storage systems and solutions:** alternative reliable, safe, inexpensive and long-term solution for various applications charged at lower pressure; different scale of reactors developed, tested and integrated; capable of storing 35-700g of H₂ at 30 bar H₂ pressure and ambient temperature; applications include power laboratories, 2-wheeler vehicles, and thermal energy storage; the only clean solution with a range (>500 km) and very low refueling time (<5mins) as compared to a battery, in the vehicular segment.



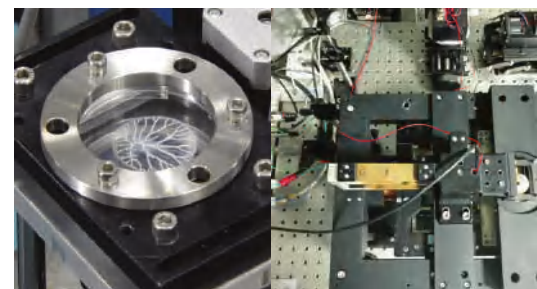
Team Surya Shakti wins Carbon Zero Challenge 3.0 for its technological innovation

- Surya Shakti - indigenously developed, sustainable, clean heating solutions for air and water:** marigold-like nanostructured material designed for highest solar heat absorption; ~90% efficiency of converting solar energy to thermal energy and thereby generating a surface temperature ~150°C under solar illumination; can be coated on a variety of arbitrary surfaces; demonstrated for several months of continuous usage for green, sustainable space/room heating to produce a temperature difference of ~35°C; advantageous for adapting to high-altitude locations such as Ladakh, Gulmarg where cold temperatures make living very challenging for Army locations; nano hard-carbon floret (NCF) coatings also convert light from low-power infra-red and commercial lamps into heat energy that can be used for similar heating applications at night
- Lightweight fuel cell stacks for light-duty vehicles:** ready-to-deploy technology suitable for automobile applications; lightweight metallic bipolar plates used to reduce weight and volume of the stack; Balance of Plant (BoP) also developed; optimum flow field designed to minimize water flooding and improve the current density distribution

- Indigenous anti-hail gun to combat hailstorms:** cost-effective eco-friendly and low maintenance fully functional anti-hail guns to stop/minimise the effects of hailstorms, protect the crops, and maintain the quality of crops; anti-hail gun sends a strong shock wave into the hail forming clouds, thus preventing further hail development and preventing crop destruction; 5 times less expensive than imported ones and 9-10 times cheaper by operation and maintenance; installed at Krishi Vigyan Kendra, Solan for sustainable apple production
- Novel method for plasma extraction from blood droplet:** Indigenous, low-cost, user-friendly, commercially viable, high yield and robust blood plasma separation device; can be integrated into plate reader/fluorescence-based camera for detection of disease biomarkers in field diagnostics; technology uses sphere-on-flat geometry in a lifted Hele-Shaw cell for recycled surface blood flow over a filtration membrane; plasma quality indicates suitability for detection of TSH biomarker



Anti-hail gun to combat hailstorms



Plasma extraction from blood droplet

Digital India Activities



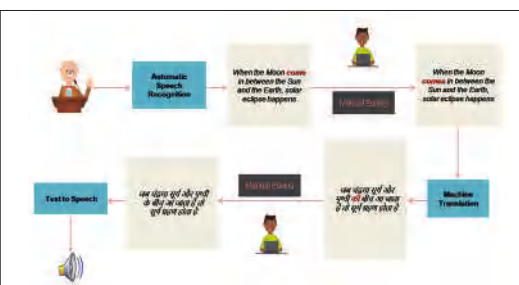
C-DAC to deploy supercomputing system at IIT Bombay, as part of NSM



IITB-FOSSEE-GIS Mapathon Team



MoU with Directorate of Technical Education, Maharashtra for Project Udaan



Speech to Speech Machine Translation

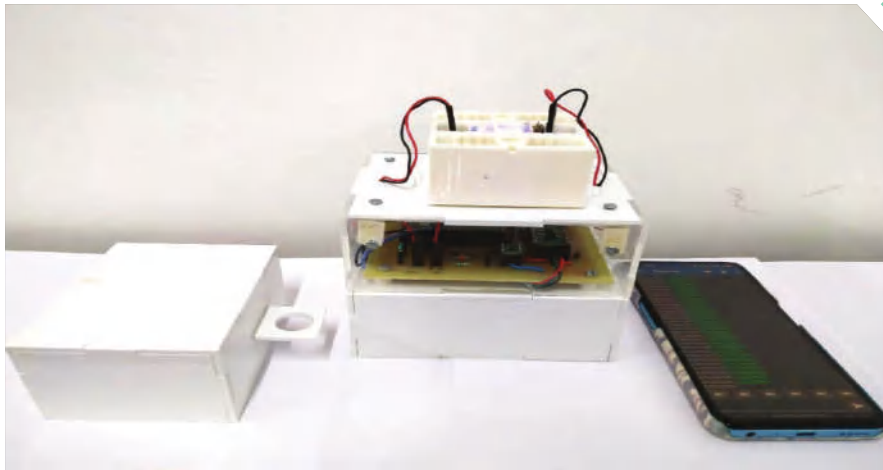
■ National Supercomputing Mission (NSM):

The Centre for Development of Advanced Computing (C-DAC) to deploy supercomputing system at IIT Bombay as part of this mission; aims to attain self-reliance in supercomputing and problem-solving in various domains of scientific and technological endeavours; the system will come with a peak computing power of 3 PF and is based on direct contact liquid cooling technology to achieve high power usage effectiveness and also reduce carbon footprint; will enable scientists and researchers to tackle complex computational problems beyond traditional computing systems' capabilities

■ **IITB-FOSSEE-GIS Mapathon:** A national-level collaborative Indian mapping event using free and open source software; encourages student participants to use QGIS, remote sensing data, state/ district level boundaries using ISRO data, Survey of India shape files, and produce maps to analyze real-world problem statements from agriculture to the Internet of Things; at 5,000 to 9,000 participants every year, the national-level collaborative Indian Geospatial Mapping event is pitched as the largest mapathon in the world

■ **Project UDAAN:** End-to-end machine translation and post-editing ecosystem; enables translation of textbooks and learning materials across English and all Indian languages; domain-specific vocabulary of more than 5 million words across 11 languages in alignment with Commission for Scientific and Technical Terminology (CSTT) dictionaries; capable of integrating user specified vocabulary/terminology; indigenous and open source post-editing tool and rich text editor specifically designed for the translation tasks with rich formatting options; offline support with seamless integration with cloud to enable work from anywhere; transforming world-class AI research into open-source tools useful for general public/businesses

■ **Bahubhaashak:** technology for speech-to-speech machine translation for education in Indian languages; enables speech-to-speech translation, ease of learning in local languages; dramatically reduces time for making lectures available in Indian languages; can be scaled to school education; promising solution for imparting quality school education in rural India



DNA sensor for wastewater disease surveillance

- **Low-cost portable DNA sensor for wastewater disease surveillance:** Aids in early detection of viral and bacterial pathogens in sewers and water bodies; device functions by detecting colour changes created by the interaction of DNA with methylene blue (MB) dye; mobile app developed can read this voltage signal via Bluetooth and display the information on a smartphone.

- **Indigenous 5G network** built towards developing an end-to-end 5G testbed; designed and implemented the 5G core components using state-of-the-art design principles such as Network Function Virtualization (NFV); multi-institutional project

- **Quantum tunneling enabled spiking neural network chip:** designed on 45nm silicon on insulator (SOI) technology; enables ultra-low area and power neural network for brain-scale computing



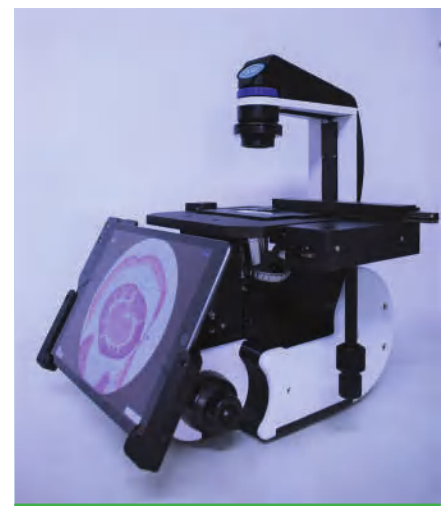
World's first quantum tunneling enabled spiking neural network chip

- **Portable digital inverted microscopes** with single and variable magnifications; inverted, bright-field microscopes for imaging slides and liquid samples; detachable digital display; supports telemedicine; ergonomic design for long working hours

- **State-of-the-art video surveillance platform (Surakshavyuha)** for security and compliance applications; provides real-time analysis to alert security systems on suspicious movements; eliminates unrequired footage in offline scrutiny; application in military surveillance; awarded the Gold Award under the category 'Outstanding research on Citizen Centric Services by Academic/Research Institution' of the National Awards for e-Governance Scheme 2021-2022

- **Dhruva:** a global navigational receiver chip that can be used in smart phones and navigation devices; capable of tuning to the navigation signals transmitted at multiple frequencies; can be readily adapted for commercial applications such as vehicle tracking, marine vessel tracking, rail/road/water transportation monitoring

Extensive funding from **Ministry of Electronics & Information Technology (MeitY), Govt. of India** allows to bring about a transformative impact in various research areas



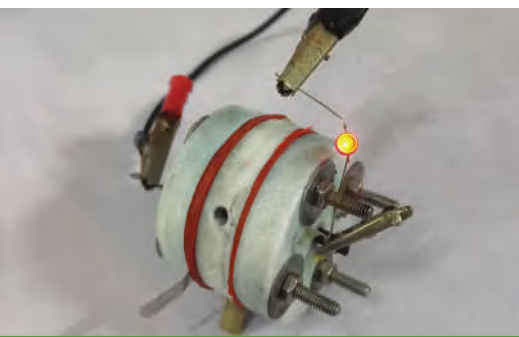
Portable digital microscope



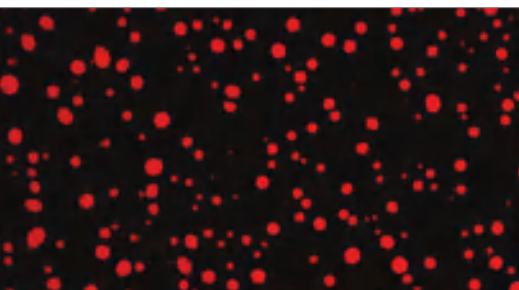
Dhruva: Indian RF receiver chip for NAVIC & GPS Satellites



High-performing unconventional optoelectronic materials for solar cells



Rechargeable metal-air batteries



Microscopic image representing formation of liquid condensates by a protein in a solution



Hand held device for non-destructive testing

- **Next-generation optoelectronic materials for solar cells** and display technologies using high-performing unconventional materials like halide perovskites / organic semiconductors; create solar cells that more efficiently generate energy than existing ones, and lighting or display technologies that consume less energy
- **Rechargeable metal-air batteries:** lab-scale prototype fabricated based on Copper hexacyanoferrate (CuHCF); improved recharge-ability; can be used for both portable and stationary applications; non-aqueous electrolyte used for metal electrode, and aqueous electrolyte used for air electrode
- **Compact handheld pulsed eddy current probe (iPEC):** for on-demand measurement of diameter and cover thickness of rebars in RCC structures; equipped with a smartphone application that enables the rapid conduct of non-destructive testing and inspection; corrosion detection in rebar at up to 5.5 cm distance from the probe; ideal for various structural analysis applications like repairs, renovations, inspections and quality control of RCC structures
- **Attosecond physics:** Ground breaking research led to the 2023 Nobel Prize in Physics; optical method for faster detection and control of qubits to enhance the speed of quantum computing; improved methods to generate attosecond pulses resulting in more accurate and cleaner videos of electronic movement; High-harmonic generation from spin-polarised defects in solids; Light-induced valleytronics in pristine graphene; Tabletop chiral attosecond laser coming soon
- **Gallium nitride based platform semiconductor technology:** provides solution for large RF power applications, like advanced terrestrial/space communications (5G/6G), radars, and signal-jamming - all of which are dual-use; fabrication and manufacturing enabled for user agencies
- **Phase separation in proteins:** Conventional theory says that the ability to phase separate is inherent in their amino acid sequence and structure; Groundbreaking study suggests that all proteins and polypeptides, regardless of their sequence and structure, can undergo liquid-liquid phase separation (LLPS), but only under distinct circumstances;

at a certain threshold concentration of macromolecules, the interactions between different macromolecules increase leading to more complex interactions that eventually cause the proteins and other macromolecules to condense out of the solution, referred to as biomolecular condensate formation; further studies ongoing towards phase separation of protein pairs in a multicomponent system

- **Spherical robot that fixes shaky videos:** New algorithm removes effects of unintended motion from videos shot with small robots or drones; significantly improves the quality of video sequences captured by these bots; finds use in both commercial and security tasks, like photography, mapping, visual inspection, target detection, and tracking.

- **Innovative approach using oxygen reduction reaction for measuring coating performance:** Hydrogen potentiometry method with conventional electrochemical impedance spectroscopy; allows quantifying buried interfacial reaction rates; offers a deeper understanding of how reactions occur at the interfaces between materials; has significant implications for various fields including energy conversion and corrosion prevention

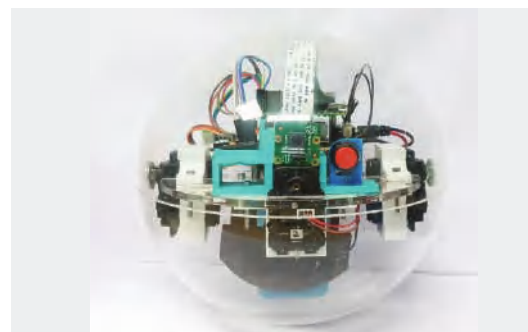
- **Scaled decentralisation systems – The future of urban water infrastructure:** a necessary paradigm shift to achieve sustainability and resilience in urban water infrastructure (UWI); benefits include reduced life-cycle costs, lower environmental impact, improved governance, increased resilience and enhanced recycling potential; increases the flexibility and adaptability of UWI crucial for building resilience in the face of climate-related extreme events

- **Efficient coal power generation using oxidation-resistant, nickel-based superalloy (Alloy 617):** Shows promising results in steam oxidation tests performed in a simulated Advanced Ultra Supercritical (AUSC) environment, specifically designed to replicate the extreme temperature and pressure conditions that exist in a coal-fired power plant; superalloy has ability to maintain integrity at levels closer to AUSC conditions indicating its potential for harnessing cleaner coal technology

- **Frugal micro fluidic device:** Lithography-less, inexpensive, portable, and scalable ready-to-use device for drug discovery and drug screening applications; will enable low-budget research labs and pathology clinics to screen drugs faster and efficiently

- **C-H activation, a major breakthrough in synthetic organic chemistry:** Sustainable and economical counterintuitive chemical reaction to simplify the production of biologically important compounds; activates unreactive carbon-hydrogen (C-H) bonds to form essential compounds called lactones found in natural products and pharmaceuticals

- **Novel design to improve safety and efficiency of battery packs:** new method removes heat from batteries more efficiently while also reducing the overall weight of the pack; broad applications in the electric vehicle industry, solar power storage, and other devices that rely on battery packs with multiple batteries



Spherical robot of 20 cm diameter



C-H bond activation to form essential compounds

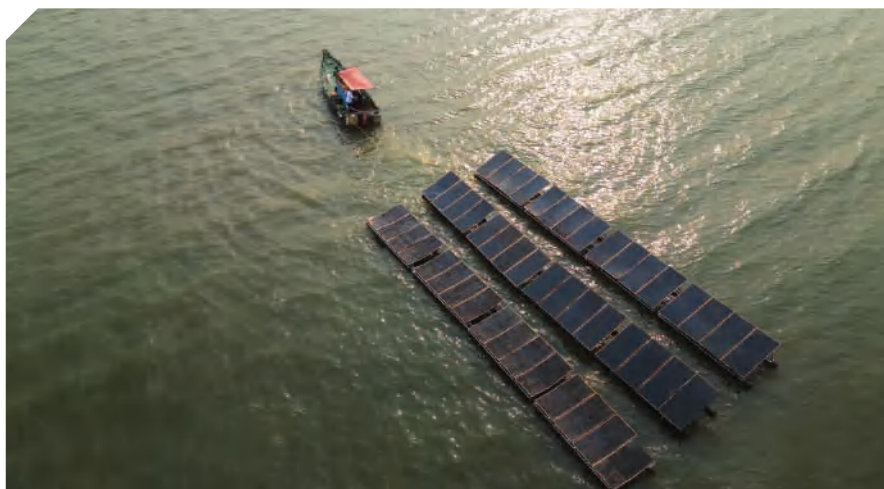


Novel design to improve safety and efficiency of battery packs



Advanced Ultra Supercritical (AUSC) lab set-up for efficient coal power generation

More glimpses of R&D



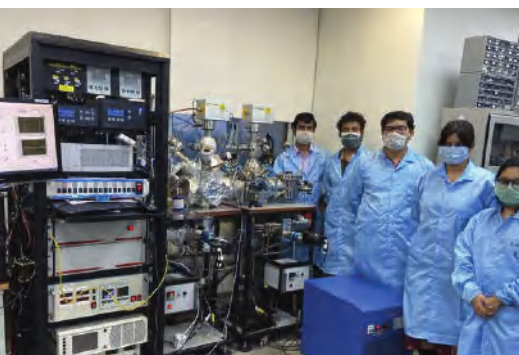
Floating solar photovoltaic system



Indoor Air Purifier for PM control



Novel bandage for better wound healing



Indigenously developed plasma-enhanced atomic layer deposition facility

- **Air pollution control devices:** with efficient filtration for controlling particulate matter pollution; captures and reduces harmful particles suspended in the air through filters; devices include UV disinfection, titanium dioxide and air filters to capture particulate matter, bioaerosols disinfection from the atmosphere
- **Solutions for healing and immunotherapy:** utilizing 3D matrices for delivery of bioactive molecules and recruitment or culture of cells serving diverse applications; developed multifunctional bilayered skin substitutes and dermal patches that polymer-based, dual-layered, topical in application with multifunctional properties like an antibacterial, anti-inflammatory, antioxidant for better wound healing; bioactive implants developed for gene delivery, allowing in-situ engineering of cells as an alternative to cellular therapies
- **Plasma-enhanced atomic layer deposition:** plays a distinctive and decisive role in facilitating thin-film fabrication with atomically controlled thickness for a variety of device applications; technique relies on the energy provided by energetic species in the plasma and growth process is self-saturated; can serve as a cost-effective alternative to commercially available deposition tools
- **Floating solar photovoltaic system:** cutting-edge research to revolutionizing the way we harness solar energy; system comprises floating modules made of a closed loop of high-density polyethylene (HDPE) pipes; internal compartments have shade/PV panel mounted; modules are connected using quick-release pipe clamps/ropes; forms an array with/without boat lanes as maintenance bays; array is anchored to an underwater floating sub-anchor
- **Using diamonds as probes to explore fast-changing weak magnetic fields:** exploiting quantum defects in diamond to image fast-changing weak magnetic fields
- **Prediction of body weight and disease risk:** Platform to help improve metabolic health and chronic disease management, utilising the individual health data (genomics, gut microbiome, blood biomarkers, and body vitals); provides personalised health analytics with diet, lifestyle, and supplementation suggestions
- **Digital Twin for Industry 4.0:** combines advanced engineering, IoT/IoE and AI to provide a holistic solution to achieve lower cost, higher quality, optimal efficiency and sustainability; can be made for a simple asset to an entire factory



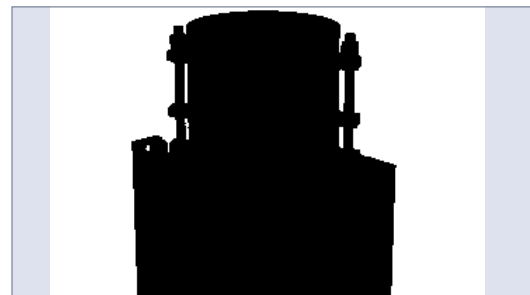
Scalable continuous flow synthesis of pharmaceuticals and agrochemicals

- **Scalable continuous flow synthesis of pharmaceuticals and agrochemicals:** reaction occurs in micro-channels in the presence of visible light and mass transfer among the molecules giving a short reaction time
- **Modular satellite subsystems:** being developed that can be integrated into a nanosatellite and ultimately launched into orbit; student satellite programme set up in collaboration with L&T; interdisciplinary team of 70 + students; aims to facilitate the growth of satellite technology by providing resources for fabrication, testing, prototype development, and procurement of satellite equipment
- **New magnetised catalyst to increase hydrogen production:** energy efficient and economical method to extract hydrogen from water; reduced cost of electrolysis
- **Quantum diamond microscope to image magnetic fields:** within microscopic 2D samples that change over milliseconds; renders the ability to image microscopic (1 micron to around 100 micron scale) magnetic fields found in microcircuits with a current flow and can potentially be extended to imaging dynamic magnetic fields from biological cells like neurons

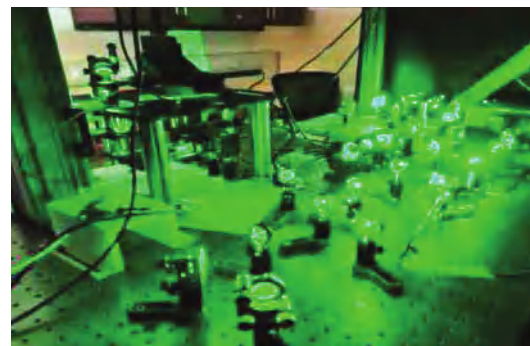
- **Solar power enabled portable electrosorption system for desalination:** on-the-go solution; operates at low pressure and room temperature, thus eliminating the requirement of high energy-consuming booster pumps and heating mechanisms respectively; doesn't use reverse osmosis membranes, thereby eliminating the problems caused due to fouling and reduced efficiency; can be scaled easily due to its modular nature
- **State-of-the-art membrane technology** for desalination and wastewater treatment; cost effective and sustainable technology to fabricate membranes for water purification and print graphene in-situ in a single step; reduces water stress and provides safe water to society
- **Microwave radiation to detect tiny plastic pollutants:** Efficient, economically viable, novel laboratory-based technique developed; can currently identify some of the most abundant types of daily-use plastics found in the environment like polypropylene, low-density polyethylene, high-density polyethylene, and cross-linked polyethylene; in the process of developing handheld devices to help manage threats posed by micro and nano plastics



Energy-efficient hydrogen production using magnetised catalyst



Modular satellite subsystems integrated into a nanosatellite



Diamond magnetic field

Industry Partnership

Active Industry Collaborations

500+

Ongoing Industry Projects

700+



MoU signing with Jindal Stainless Limited (JSL)



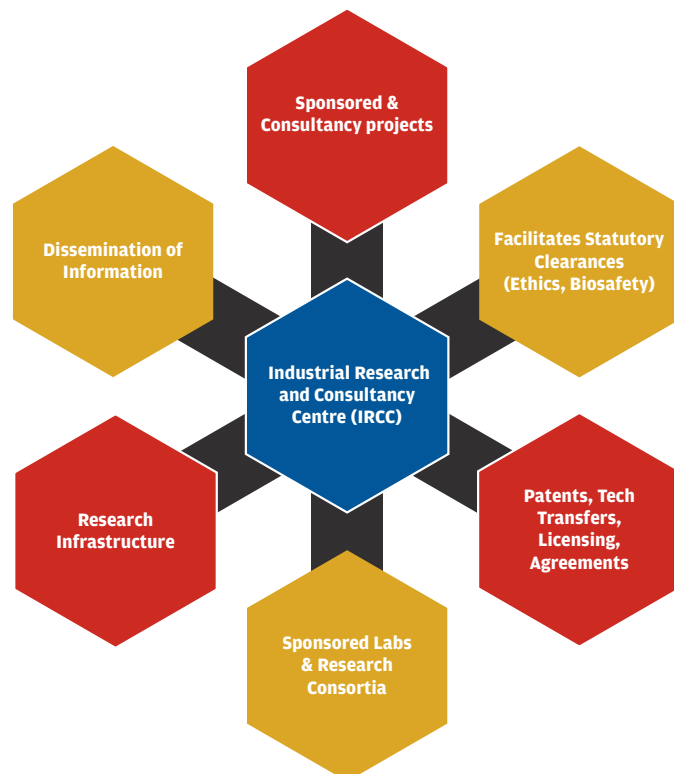
R&D collaboration with UN World Food Programme

Benefits

- Access to fresh ideas, innovation and talented student base
- Knowledge creation, technology & HR development
- Access to high-end equipment and other resources
- Facilitating processes and systems for collaboration
- Complementary skills and capabilities upgradation
- Access to qualified personnel for recruitment
- Multidisciplinary research pool
- Access to new technologies
- Leverage public funding

R&D Projects at IIT Bombay

Industrial Research and Consultancy Centre (IRCC) at the office of the Dean (R&D) is the nodal unit responsible for managing and coordinating all activities related to research and development at the Institute. It has streamlined processes for financial, manpower and intellectual property management. IRCC has also initiated many schemes for incentivising and supporting researchers. It facilitates interactions with various external agencies for funding and licensing activities.



Modes of Collaboration

Consultancy Projects

- Short term projects to solve specific problems of industry
- Scope of work and deliverables are well defined

Sponsored R&D Projects

- Long term projects for new knowledge generation in current, emerging and futuristic areas
- Deliverables may include IP generation, manpower development and publications

Research Cell for collaborative projects

- Fairly long term research collaboration in broadly defined areas of mutual interest to industry and IIT Bombay
- Multiple research projects to be executed by IIT Bombay faculty with industry feedback
- Industry can define problem statements, collaborate on the projects, receive ownership for IPs and commercially exploit new technologies

Sponsored Research Laboratories at IIT Bombay

- Research facility / laboratory sponsored by an industry in an area of interest, helping build the infrastructure at IIT Bombay. Such facilities and laboratories will be shared with the sponsoring industry and may also be open to others on a case-to-case basis.



Streaming analytics over temporal variables from air quality monitoring (SATVAM)



Synopsys Semiconductor Lab for virtual fab solutions



INOX Cryogenic Research Lab

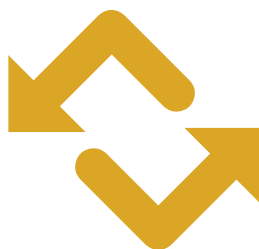
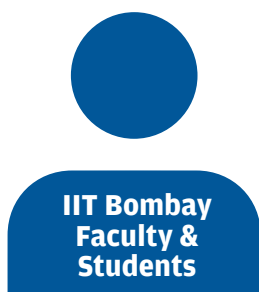


Forbes Marshall Energy Efficient Lab

Exchange Visits



IIT Bombay students on a visit to United Phosphorous Limited



IIT Bombay faculty at Industry

Sabbatical like visit

- May, June, December
- Primarily for ice breaking:
 - » Interact with R&D staff
 - » Seminar / lecture
 - » Site tour
- Not for consultancy

Other types of visits

- Any time of the year
- Customise
 - » Frequency of visit
 - » Duration of visit
 - » Scope of work

Industry personnel at IIT Bombay

- Frequency / duration flexible
- NDA prior to visit
- Industry responsibility
 - » Health / accident insurance
 - » Salary / remuneration
 - » Accommodation / transport

Student Internship

- Credit based internship
 - » In a core industry
 - » Faculty mentor from IIT Bombay
- Non-credit based internship

Industry Sponsorships and Fellowships at IIT Bombay

Sponsored PhD and Masters Program

- Objective is to jointly promote research and manpower development
- Industry can sponsor students to work in an area of its interest
- Sponsorship includes monthly stipend (amount not less than that given by Government of India funding agencies) and a contingency grant
- Industry may define project scope
- Flexible IP norms

Prime Minister Fellowship

- Scholarship from GoI as per norms
- Additional matching amount from partnering industry
- Duration of fellowship is four years
- Up to 100 new fellowships are provided every year



2+1 Year MTech model:

| | |
|--------|---|
| Year 1 | Course Work |
| Year 2 | MTech project working on a research problem identified by Industry; Student will graduate with MTech degree |
| Year 3 | Continue to complete project work at IITB or field |

Industry Sponsorship / Fellowship

| Program | Duration | Amount (in ₹) |
|------------------------|----------------------|---|
| Post-Doctoral Fellow | Variable | 55,000 - 85,000 per month (+ HRA as applicable) |
| PhD | 5 years | 23,00,000 + HRA as applicable (as per Visvesvaraya PhD Scheme) |
| MTech (2+1 Year Model) | 2 years (Year 2 & 3) | 13,00,000 (higher funding for Year 3 due to out of campus expenses) |
| Masters | 2 years | 7,00,000 |

Consortia and Centres of Excellence at IIT Bombay



Centre for Machine Intelligence and Data Science (C-MInDS)

Set up to nurture talent pool in artificial intelligence, data science, and related areas in different application domains



Centre of Excellence in Oil, Gas, and Energy (CoE-OGE)

To provide a competitive advantage to India's oil and gas sector by identifying indigenous solutions and energy resources to cater the challenges faced

Funded by India's seven blue-chip oil firms including IOCL, BPCL, HPCL, GAIL, ONGC, EIL & OIL



Koita Centre for Digital Health (KCDH)

Set up under the aegis of the Koita Foundation; research focus areas are clinical applications (including electronic patient records and medical imaging), healthcare data management (including data privacy and security), healthcare analytics, healthcare AI/ML, consumer health, public health and public policy



National Centre of Excellence in Carbon Capture and Utilization (NCoE-CCU)

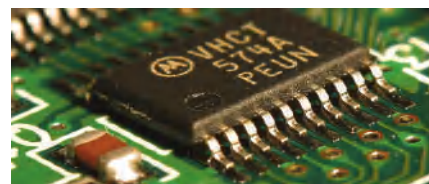
Hub for state-of-the-art research and application-oriented initiatives to accelerate efforts towards carbon dioxide capture, compression, transport, and utilization in enhanced hydrocarbon recovery as co-benefit pathways

Funded by DST, GoI



Center for Semiconductor Technologies (SemiX)

Enables semiconductor industry focussed R&D, workforce development and entrepreneurship by serving as a common interdisciplinary platform to integrate the energies of multiple involved academic disciplines, Indian semiconductor consumers and creators, academicians, entrepreneurs, investors, and government policy makers; center leverages the strong knowledge and outreach networks already established at the institute; nodal point to facilitate semiconductor related r&d, training, translation, incubation, and formulation of policy inputs



Nanoelectronics Network for Research and Application (NNetRA)

Initiative by Ministry of Electronics & Information Technology (MeitY) to push the frontiers of nanoelectronics through basic research in this field; to engage in nano electronic device and system



Centre of Excellence in Smart Drone and Integrated Mobility Systems

For R&D, manufacturing, testing, and training; permission granted by the Ministry of Civil Aviation for research, development and testing of drones on its IITB premises



Centre of Excellence in Steel Technology (CoEST)

For R&D in steel technology and creation of high quality manpower for the industry

Funded by Ministry of Steel, GoI



Quantum Information Computing Science & Technology (QuICST)

Hub for quantum science and technology research and education; research activities span over all four verticals namely computation, communication, sensing and materials; aided by state-of-the-art nanofabrication and measurement facilities, and strong support from quantum theory groups



Sunita Sanghi Centre of Ageing and Neurodegenerative diseases (SCAN)

Aimed towards developing tech solutions for timely detection and treatment of neurodegenerative disorders in the elderly; Envisions creating novel tools and biomarkers for Parkinson's, Alzheimer's and Frontotemporal Dementia; Thrust areas include understanding disease mechanisms, diagnosis, devices and policy studies



Medical Engineering Design & Innovation Centre (MEDIC)

Aims to develop cost-effective, portable and highly accurate biomedical devices with real-time monitoring for the rural and urban areas of India; focus areas include maternal & child health, biomedical devices, orthopedic care, cardiac care, drug delivery, physician assistance, biosensors, psychotherapeutics, ageing health & care product



Wadhvani Research Centre for Bioengineering (WRCB)

Inter-departmental virtual centre focusing on technology translation in the broad domain of healthcare delivery, with emphasis on technology innovation and commercialisation



National Centre for Photovoltaic Research and Education (NCPRE)

Provides R&D and educational support for India's ambitious 100 GW solar mission

Funded by MNRE, GoI



Photovoltaic Technology and Innovation Center (PoTIC)

Set up to effectively work with industry and alumni to meaningfully contribute to the country's PV missions; builds on the expertise developed through NCPRE and other national and international projects at the Institute



Biomedical Engineering and Technology Innovation Centre (BETIC)

Integrated facilities for design, analysis, prototyping and testing of medical devices

Funded by DST & Maharashtra Govt.

IITB Trust Lab



Envisions strengthening the country's digital environment, making it more trustworthy, and working towards a secure and responsible Digital India; enabling world-class research and collaborations, through research grants and specialized activities; revolutionizing digital trust education in India through trustnet; identifying and executing high-impact development projects; outreach activities; seeding and nurturing technology start-ups

Desai Sethi Centre for Entrepreneurship (DSSE)



Trains aspiring entrepreneurs through courses and pre-incubation programs at IITB; courses in innovation and entrepreneurship either as electives or pursued as a minor in entrepreneurship; Interactive and experiential pedagogy based on concept-based class discussions, field assignments and team projects, guest entrepreneurs and case studies; pre-incubation programs wherein students receive grants, access to facilities for working on prototypes and mentoring for developing their business model; about 750+ students mentored by alumni, 60+ startups initiated, 200+ venture teams created, and 3000+ students trained



Technocraft Centre for Applied Artificial Intelligence (TCA2I)

To foster collaboration in applied Artificial Intelligence (AI) through research and outreach, using the expertise of faculty in AI, decision sciences, machine learning and optimisation



SBI Foundation Hub for Data Science and Analytics

Specifically designed to address the unique challenges faced by the Indian banking and financial services sector by applying Data Science and AI principles; pivotal role in stimulating innovation within the digital banking realm and promoting research in emerging fintech domains; competency building and bolstering skillsets; outreach initiatives that will augment and broaden the community of professionals skilled in banking analytics



Take it easy!

HDFC Ergo-IITB Innovation Lab

Aimed at operationalizing high-impact projects across the insurance value chain and developing solutions to relevant business challenges; first centre in the insurance sector to provide long-term strategic business solutions by leveraging the start-ups at DSSE and SINE respectively; 50 high-impact projects to be funded over 5 years across business verticals like acquisition, servicing, claims, renewal, underwriting actuarial practices and operations



Bank of Baroda IIT Bombay Innovation Centre

Foster innovations in the financial hardware space and contribute to bank's digital strategy; be the fountainhead of Innovation for the entire BoB group including capital markets, asset management, insurance, shared services, etc; aims to create cutting edge technology such as analytics to forecast cash replenishment rates at ATM centres, PoS machines with value added services



JSW Technology Hub

First-of-its-kind, state-of-the-art technology hub for research in steel manufacturing in India; joint research and training projects with JSW Steel to develop patented industrial applications and solutions, with enhanced focus on research and education on new and emerging technologies



IITB-FedEx Centre for Advanced Logistics & Analytics

Partnership with FedEx Express to develop innovative technologies addressing key logistics and supply chain challenges; Centre will focus on reducing cost and enhancing operational efficiency using advanced quantitative models and solution technologies in supply chain network design and planning; the collaboration will leverage the institute's research expertise and its robust entrepreneurial ecosystem to support the development of technologies and the creation of a highly skilled talent pool



DeSaltM

Established with the aim of developing state-of-the-art technologies with five IITs: IITB, IITD, IITKGP, IITT & IITH and other stakeholders from industries and NGOs to provide various desalination, brine management, and water recycling technologies. Objectives include developing strategies and technologies for desalination, sustainable treatment, and reuse of water; translating water technologies based on the membrane using the resources, mechanisms and knowledge acquired; incubation and commercialization of developed technologies and products



DRDO-Industry-Academia Centre of Excellence (DIA-CoE)

to harness and synergize the combined strength of academia, student community, research fellows, niche technology industries and DRDO scientists to provide impetus to research and innovations in identified futuristic defence technological domains through multi-disciplinary & multi-institutional collaborative efforts; research verticals include aero engine (small turbo fan engine & large aero engine), solid propellant combustion modelling, morphing wing aircraft technology, and hypersonic propulsion

Ashank Desai
Centre for Policy Studies

Ashank Desai Centre for Policy Studies

Envisions to encourage a sustained dialogue between academia and other policy stakeholders in order to promote evidence informed and inclusive policy making and analysis, and create capacity for policy studies in India; Offers Masters and PhD programmes with courses in policy theory and specific policy domains



Advanced Mechanical Testing Facility (AMTF)

State-of-the-art central facility to cater to the needs of fatigue testing ranging from 220N to 250kN load, -120°C to 1200°C temperature and uniaxial-torsional-planer biaxial loading
Open to industries and others



Water Innovation Centre: Technology, Research and Education (WICTRE)

Aims at innovation through excellence in sustainable water purification technologies to solve water related problems for society

Funded by DST, GoI



National Centre for Aerospace Innovation and Research (NCAIR)

Aims to provide economically viable, sustainable solutions to Indian aerospace manufacturers

Founding members DST, IITB, Boeing, HAL and NAL



National Centre of Excellence in Technology for Internal Security (NCETIS)

Develop indigenous, state-of-the-art, self-sufficient technology solutions to address internal security challenges faced by indian security forces and law enforcement agencies; capacity building for technology enabled policing; be a resource center for technology needs for internal security forces



IIT BOMBAY Centre for Liberal Education

Centre for Liberal Education (CLE)

Facilitates interdisciplinary studies in the Liberal Arts, Sciences, and Engineering (LASE) program, enabling the freedom to specialise in ground breaking, cross-cutting fields such as AI and EdTech or Healthcare Engineering



Parimal and Pramod Chaudhari
Centre for Learning and Teaching

Parimal & Pramod Chaudhari Centre for Learning & Teaching

Aims to facilitate and support pedagogy by promoting innovation, evidence - based practices and collaboration; activities cover research in teaching & learning, development and assessment of academic programs & curriculum, development of teaching methods for large classes, teaching with technology & software, employing inclusive teaching strategies, etc.



Tata Centre for Technology and Design (TCTD)

Aims to develop solutions to challenges faced by resource constrained communities using an end-to-end innovation approach

Supported by Tata Trusts

CEP Outreach

With the rapid pace of growth in science and technology and frequent paradigm shifts in policy, governance and management, continuing education of working professionals is a vital need for development.

The Executive Education (Exec-Ed) office at IIT Bombay has been set up to meet the knowledge upgrading and upskilling needs of working professionals in the S&T industry, academia and governance.

IIT BOMBAY EXECUTIVE EDUCATION

Variety of programmes offered through Exec-Ed have been fulfilling the wide spectrum of continuing and executive educational needs of working professionals from diverse disciplines, and we justifiably take pride in the fact that it is one of the most sought after continuing education centres within the country.
www.cep.iitb.ac.in

Chair Professorship

Being appointed to an endowed chair is one of the highest honors awarded in the academic arena and is reserved for the top faculty members at IIT Bombay as an acknowledgment of their signal contributions in research and teaching.

The prestige of an endowed chair also lends an additional cachet to the departments. It helps to attract the best and brightest young students and investigators thus securing the future of the institution.

Chairs have been established with generous donations from alumni and other friends of the Institute. In addition, IIT Bombay has also created Institute Chairs.

~35 Chairs established.

TATA Chair
Inani Chair
P. K. Kelkar Chair
Ramkrishna Bajaj Chair
Kamalnayan Bajaj Chair
Romesh Wadhvani Chair
Google Cloud Chair
Bajaj Group Chair
D. L. Shah Chair
Pramod Chaudhari Chair
L&T Chair
Madhuri Sinha Chair
G.K. Devarajulu Chair
SUBRAO M. NILEKANI CHAIR
Maharashtra Pollution Control Board
Biswas-Palepu Chair
HAL R&D Chair
Forbes Marshall Chair
N.R. Kamath Chair
Praj Industries Chair
Vijay and Sita Vashee Chair
Bank of Baroda Chair
Rahul Bajaj Chair



IIT Bombay joins hands with **Google Cloud**
to set up a Chair Professorship in Generative AI

Models for IP Commercialisation

Collaborative development and licensing

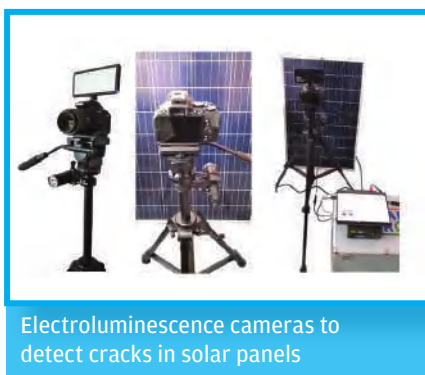
- Joint ownership of IP
- First option for exclusive licensing
- IP ownership to industry on mutually agreed terms

Licensing of IP generated in the Institute

- IP generated through academic / unrestricted sponsored research
- Exclusive or non-exclusive license (preferred) offered to interested Industries

Incubation / Entrepreneurship

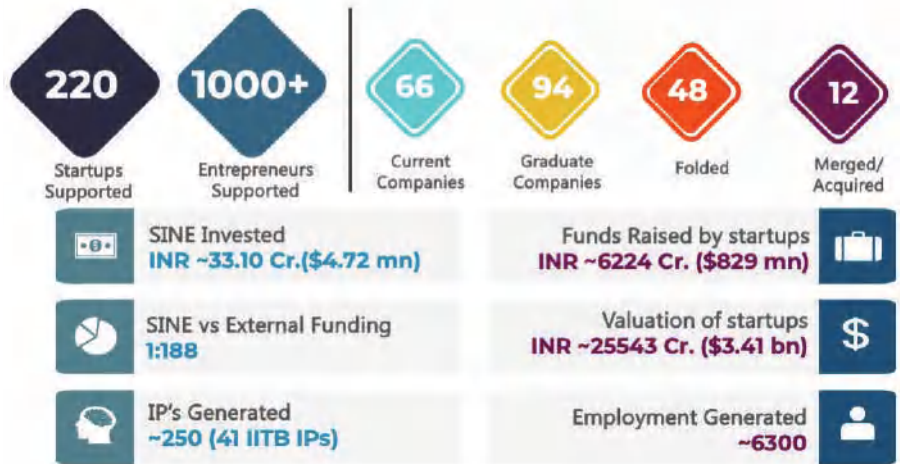
- Through Society for Innovation and Entrepreneurship (SINE), the technology business incubator of the institute
- IIT Bombay IP taken up in the start-up companies, promoted by faculty, students and alumni
- IP licensed to incubatee companies



Technology Business Incubation



Society for Innovation and Entrepreneurship (SINE) is the technology business incubator at IITB set up in 2004. SINE supports technology startups founded by IITB community or that are based on IITB technologies, and extends the role of the institute by facilitating conversion of R&D into entrepreneurial ventures. Incubated companies cover a diverse spectrum of technology areas including healthcare, big data analysis, mobile apps, fintech, nanotech, biotech, clean-tech, social media, etc. www.sineitb.org



IIT Bombay Research Park Foundation

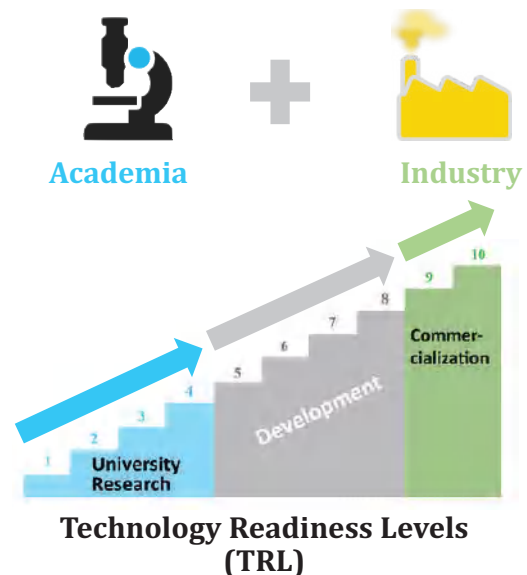


IIT BOMBAY RESEARCH PARK
aspire

A not-for-profit arm of IIT Bombay registered as a Section 8 company, the IIT Bombay Research Park Foundation was established in 2014, with financial support from the Ministry of Human Resource Development, Govt. of India.

This Foundation aims to provide an ecosystem wherein researchers from IIT Bombay and industry work in close collaboration with each other for product innovation, addressing technology challenges and in research areas of mutual interest.

Through this Foundation, IIT Bombay aims to collaborate with large, medium and small enterprises, technology startups and accelerators. The Foundation provides a mechanism for technology-focused companies to co-locate R&D personnel at IIT Bombay and seamless access to laboratories, research infrastructure and other research services. Industry R&D personnel can have close interaction with IIT Bombay faculty and student researchers. Several companies are partners currently.



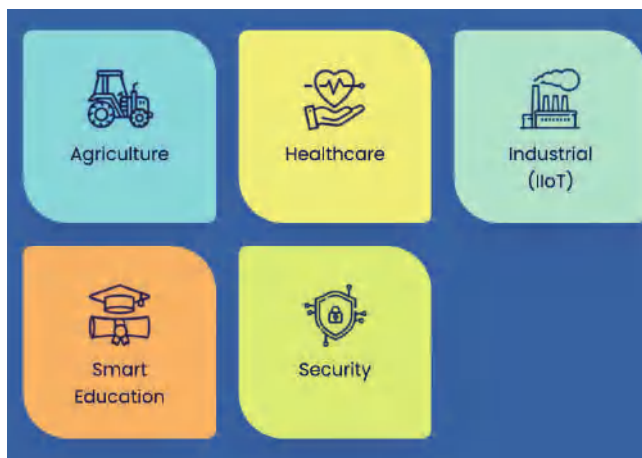
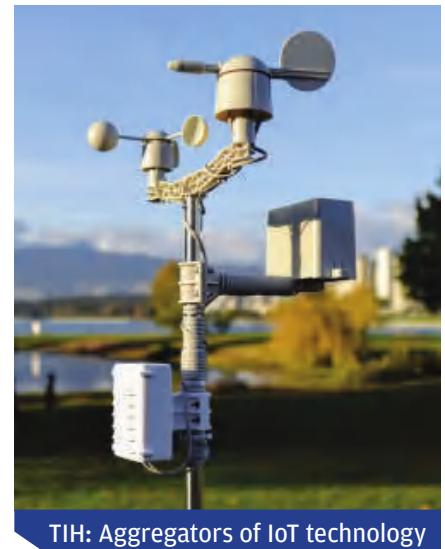
Technology Innovation Hub for IoT & IoE

The TIH Foundation for translational research on IoT and IoE (TIH-IoT) is conceptualized by the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), and is being implemented by the Department of Science and Technology, GoI, in its quest for Industry 4.0 and related areas.

In order to leverage the strength of academia in innovation and to ensure proximity to captains of industry, the TIH-IoT is established as a section 8 company (not-for-profit) at IIT Bombay.

The hub focuses on creating a self sustained effort towards cutting edge innovation through continuous research, leading to a robust ecosystem of entrepreneurship in advanced technology and innovation, backed by the brightest minds in the country. The goal is to help India become a leader in technology led economic growth.

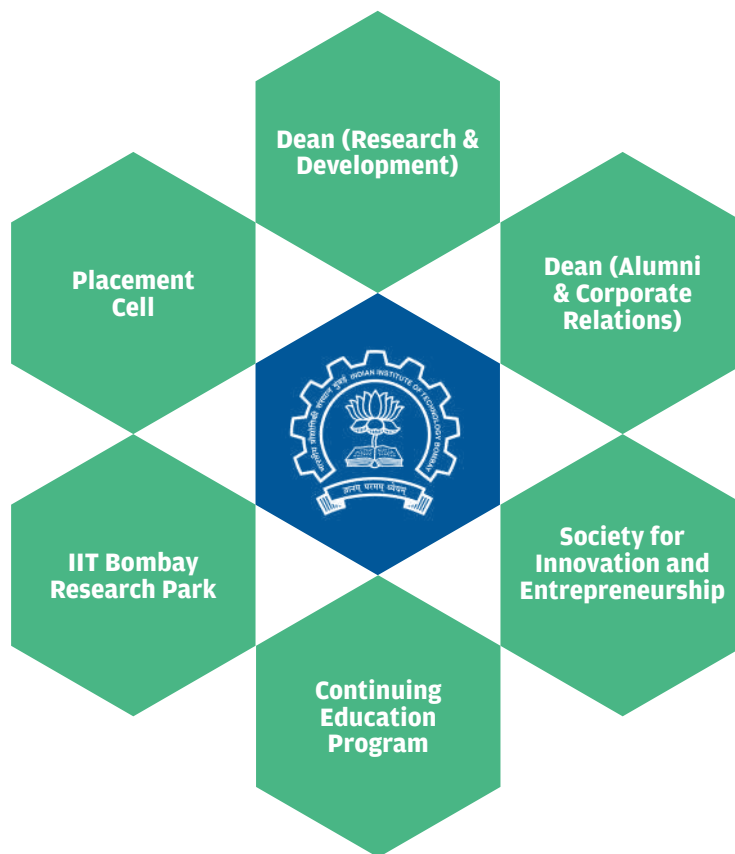
The multi-disciplinary technical verticals include: Sensors & sensor network; Low power & energy constrained devices; Communication protocol & security; Data analytics & machine learning; and Real-time control, planning & estimation.



Translational Research Centre (TRC)

Aims to create an ambience that will provide infrastructural support, enable the maturation of early-stage breakthrough innovations toward creating societal and industry impact, and address some of the critical challenges in the deep-tech area. The centre is expected to strongly support the existing innovation ecosystem, play a pivotal role in maturing the fountain of ideas emanating from academic research, and result in ripe technologies for commercialization.

Industry Interfaces at IIT Bombay



Society for Innovation and Entrepreneurship (SINE)

Technology business incubator which provides 'start to scale' support

Platform to foster entrepreneurship and nurture tech start-ups



pic.sine@iitb.ac.in

Tel: +91 22 2576 7016

www.sineiitb.org

IIT Bombay Research Park

Facilitates establishment of an innovation hub inside IIT Bombay through industry - academia collaboration

Joint IIT Bombay - Industry Research & Development groups for stronger impact



info@iitbresearchpark.com

Tel: +91 22 2572 0292

www.iitbresearchpark.com

Continuing Education Program (CEP)

Assists working professionals in widening their knowledge base and improving their skills

Single point contact for all courses and industry specific programs



pic-cep@iitb.ac.in

Tel: +91 22 2576 7006

www.cep.iitb.ac.in

Dean (Research and Development)

Create and maintain an environment, including research infrastructure and support staff for R&D

Facilitate collaboration, both within and outside the Institute

Liaise with funding agencies and industry, provide support for MoUs and agreements

Exploit IIT Bombay R&D through licensing and commercialisation

Provide administrative support for R&D at the Institute



dean.rnd@iitb.ac.in

Tel: + 91 22 25767039

www.rnd.iitb.ac.in

Dean (Alumni and Corporate Relations)

Promote and strengthen engagement with the Alumni and Corporations

Manage utilisation and enhancement of the Institute's endowments and gifts from well-wishers



dean.acr@iitb.ac.in

Tel: +91 22 2576 7023

www.alumni.acr.iitb.ac.in

Dean (Academic Programs)

Course curriculum, academic programs

Student sponsorships and fellowships



dean.ap@iitb.ac.in

Tel: +91 22 2576 7049

www.iitb.ac.in/acad

IIT Bombay Placement Office

Responsible for campus placement, student internships at IIT Bombay

Excellent infrastructure and student volunteer teams to coordinate activities



pic.placement@iitb.ac.in

Tel: +91 22 22576 7092

www.campus.placements.iitb.ac.in



Research Facilities

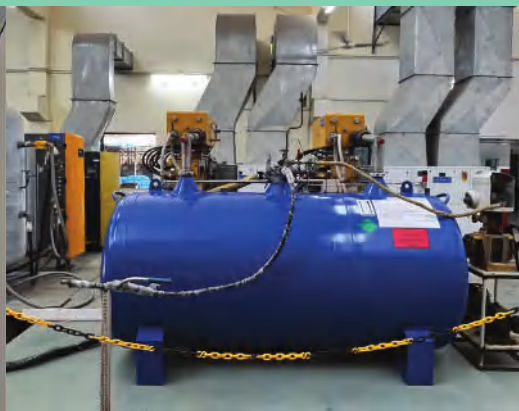
▼ Laser Scanner Microscope Facility



▼ Coating machine for battery prototyping



▼ Liquid Nitrogen Plant



▼ Protein Crystallography Facility



▼ Laser Doppler Vibrometer



▼ Spinning Disc Confocal Facility



▼ Liquid Chromatography High Resolution Mass Spectrometer



▼ High Resolution X-Ray Diffractometer



▼ Cryo FEG Scanning Electron Microscope



▼ 750 MHz NMR Spectrometer



▼ Electrochemical Capacitance Voltage Dopant Profiler



▼ Inductively Coupled Plasma Atomic Emission Spectroscopy System



Student Initiatives



IITB Racing



ASME

Solar Decathlon



MATSYA



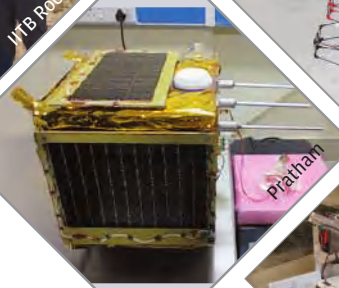
Mars Rover



IITB Rocket Team



AeroVe



Pratham



IGVC

The Industrial Research and Consultancy Centre (IRCC)

IRCC was established in 1975 as the nodal unit responsible for managing and coordinating all activities related to research and development at the Institute, including facilitating interactions with external agencies, setting up simplified processes for financial, manpower and intellectual property management, licensing activities and schemes for incentivising and supporting researchers.



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