TRANSFORMING TOMORROW

WHERE INNOVATION MEETS IMPACT

**PIONEERING RESEARCH. REAL-WORLD IMPACT.
TRANSFORMATIVE IDEAS
FROM IIT MADRAS.**

INDIAN INSTITUTE OF TECHNOLOGY MADRAS
OFFICE OF ALUMNI AND CORPORATE RELATIONS

bharat INNOVATES 2026
GLOBAL ACCELERATOR FOR INDIAN EDUCATION ECOSYSTEM

FOREWORD

IIT Madras has built a research ecosystem globally recognized for its depth, diversity, and translational impact, advancing knowledge across disciplines while addressing challenges of national importance.

The **Institute of Eminence (IoE)** status has been a transformative milestone, enabling the establishment of **15 interdisciplinary Centres of Excellence (CoEs)** that have significantly strengthened this ecosystem and catalysed research prowess. These CoEs drive cutting-edge work across frontier domains such as deep technology, digital public infrastructure, clean energy, healthcare, mobility, manufacturing, and artificial intelligence translating research into solutions of national and global relevance.

Industry collaboration is central to this vision. Corporate India today stands at an inflection point, with technology and innovation reshaping every sector from manufacturing and mobility to finance, health, and education. By co-creating research roadmaps, funding high-risk, high-impact projects, and engaging with our Centres of Excellence, industry partners are helping IIT Madras push the boundaries of what is possible.

As Bharat aspires to become a developed nation by 2047, the next leap will demand that we scale our efforts: larger collaborative programmes, bolder bets on frontier technologies, and even closer alignment between academic research, industrial deployment, and public policy. Industry collaboration will be pivotal in taking the IIT Madras research ecosystem to this next level helping us move faster, think bigger, and ensure that innovation reaches every segment of society.

This booklet offers a glimpse into IIT Madras' commitment to nation-building powered by the IoE initiative and strengthened by industry collaboration and we hope it inspires many more organisations to join us on this journey.

Indian Institute of Technology Madras
Office of Alumni and Corporate Relations

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Research Centres at IITM

IIT Madras - An Overview

IIT Madras stands as India's premier engineering institute, recognized for its excellence in technical education, research, innovation, entrepreneurship, and industry consulting. Holding the No. 1 engineering university distinction ever since the NIRF ranking framework was launched, the institute was also designated as an Institute of Eminence, reinforcing its global reputation.

Situated on a lush 250-hectare campus, IIT Madras is home to 700+ faculty members, 10,000+ students, and 1,250 administrative staff, fostering a dynamic academic environment. With 16 academic departments, advanced research centres, and over 100 laboratories, the institute drives cutting-edge advancements across engineering and pure sciences.

Beyond academics, IIT Madras is a leader in technology-driven societal impact, leveraging Corporate Social Responsibility (CSR) initiatives to address critical challenges in energy, education, agriculture, AI, water, waste management, housing, and healthcare.

Through its interventions in Agriculture & Farmtech, Water Technology, Education & Entrepreneurship, Energy, Innovation, Healthcare, Environment, and Skilling, the institute is shaping enduring value and lasting social impact via technology and research.

Research at IIT Madras

Over the last few decades, IIT Madras has seen a striking transformation from an engineering institute par excellence in the early 1960s to one that today is among the most innovative in India. IIT Madras has consistently led R&D innovation - be it the cutting-edge Centres of Excellence for research or interdisciplinary schools and departments driving innovation and entrepreneurship,

IIT Madras has built a strong legacy in research and innovation, with over 2,586 publications in leading international journals and more than 417 patents reflecting its intellectual strength. The Institute's contributions have earned widespread recognition, including 65+ international and 365+ national awards.

Under the Government of India's **Institute of Eminence scheme**, IIT Madras hosts 15 Centres of Excellence that drive cutting-edge, interdisciplinary research aligned with national priorities. Together, these achievements underscore IIT Madras' commitment to translating research into global impact and real-world solutions for Bharat. These and other research centres are exemplars of both fundamental and translational research.

Over the past decade, industry-funded research projects have grown from 501 in 2015–16 to over 980 in FY 2025–26, alongside the creation of 400+ startups building a strong pipeline from lab to market and driving research funding through industry and CSR partnerships.

This is the beginning of a larger journey, a journey of partnerships and collaborations for the greater good of the nation. While Government support has laid the foundation, it is the strength of our partnerships with industry and corporates that will catalyse this growth. Deeper collaboration between industry and academia will be critical to scaling the impact of research and innovation to address national priorities.

Today, we are on a trajectory to become a global leader in scientific thought and innovation. Because every research accomplishment, patent filed, and technology developed at IIT Madras takes our nation a step closer to the ambitious goal of Viksit Bharat 2047.

This is our vision. This is our dream for Bharat.
From IITM. For Bharat. Building Together.

PARTNER WITH IIT MADRAS

IIT Madras offers multiple pathways for corporates, industry leaders, and public sector organisations to engage meaningfully with its research ecosystem enabling the translation of cutting-edge innovation into real-world impact.

Building on existing engagement models , organisations can collaborate with IIT Madras through:

- **Strategic Research Partnerships:** Co-create long-term research programmes aligned with national and industry priorities
- **Sponsored Research & Consultancy:** Leverage IIT Madras' expertise to solve complex, real-world challenges
- **Technology Development & Translation:** Work with Centres of Excellence to take innovations from lab to deployment
- **Innovation & Startup Ecosystem:** Partner with incubated startups and support deep-tech commercialization
- **Infrastructure & Centre Building:** Establish or support Centres of Excellence, labs, and shared research facilities
- **Talent & Capability Development:** Upskill workforce through executive education, training, and joint programs
- **Endowments & Institutional Support**: Contribute to scholarships, chairs, and long-term institutional initiatives

These collaborations enable organisations to not only address immediate business challenges but also contribute to building scalable solutions for national priorities.

Get in Touch
To explore collaboration opportunities or initiate a partnership, please reach out to:

Office of Alumni and Corporate Relations (ACR)
Indian Institute of Technology Madras
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📞 [9444573737, 9884637300]
🌐 [Sociity link]

THE IOE– CENTRES OF EXCELLENCE

Significance of IoE Status & CoEs at IIT Madras

IIT Madras (IITM) was conferred the status of an 'Institute of Eminence' by the Government of India, in September 2019. The Institute of Eminence (IoE) scheme is a flagship initiative by the Government of India designed to transform select higher educational institutions into world-class teaching and research hubs. IIT Madras was chosen as one of these elite institutions in 2019, marking a pivotal step in its evolution and global standing.

Amongst its world-class faculty, students, infrastructure and research, the Institute boasts of 15 Centres of Excellence established under the IoE scheme. The Centres are devoted to research in not just the core engineering branches, but cover several inter-disciplinary domains and embrace contemporary topics as well, such as environment & sustainability, circular economy, sports science & data analytics, medical science & technology, advanced materials, and cancer genomics & therapy, to name a few.

Institute of Eminence – Centre of Excellence

HEALTH CARE	ENVIRONMENT & SUSTAINABILITY	INNOVATION	CUTTING EDGE
HTIC/ Brain centre	Energy consortium	Non Destructive Testing(NDE 5.0)	Critical Transitions
Cancer Genomics	Geo- Physical Flows	Quantum centre for Diamond Materials	Molecular Materials
Soft & Biological Matter	Low Carbon Construction(TLC2)	Sports Science & Analytics	Quantum Computing
	Maritime		RF/ Analog/ Mixed Signal ICs
			Atomistic Modeling

Together, these 15 specific centres have generated 245 patents and secured over ₹900 Cr in independent funding

Building World-Class Research

The IIT Madras IoE Story

- A Govt of India initiative to elevate select institutions to world-class teaching and research standards.
- Key research initiatives evolving into Centers of Excellence within IITM

2018 — IOE Scheme formulated
Government of India policy announced

2019 — IIT MADRAS selected as IOE
Choosen among top HEIs in India

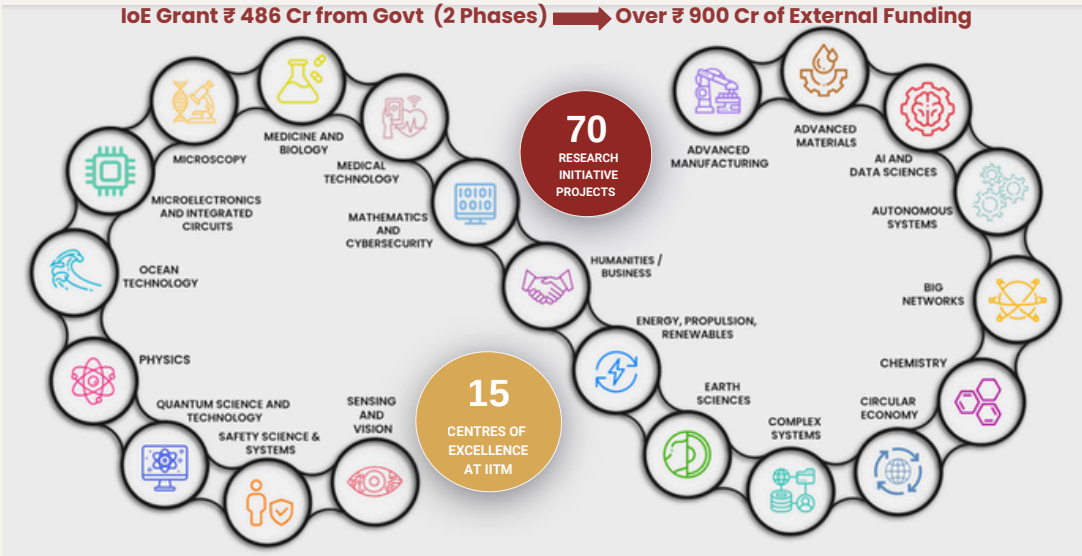
Phase I 2020-21 — 68 exploratory projects funded
Across 21 technology clusters, 400+ faculty

Review 2022 — Rigorous external review
Phase II selection process begins

Phase II 2023

15	22	70	21
CoEs	Research Centres	Projects	Technology Clusters

IoE Grant ₹ 486 Cr from Govt (2 Phases) → Over ₹ 900 Cr of External Funding



923 Cr - Funds raised | **5437 - Research papers** | **49 - Start-ups**

Benefits of IoE Scheme

Enhanced Autonomy for research

IoE status helped with financial support enabling IIT Madras to pursue ambitious research goals, undertake cutting-edge projects, and attract top talent. The institute enjoys greater academic, administrative, and financial autonomy, freedom to recruit international faculty, collaborate globally, and design its own curriculum.

Establishment of Centres of Excellence

Leveraging IoE funding, IIT Madras launched these 15 Centres of Excellence (CoEs) after a rigorous selection process from 68 research initiatives across 21 technology clusters. These CoEs focus on next-generation technologies and interdisciplinary research, aiming to make a significant impact both in India and internationally.

Promotion of Interdisciplinary and Impactful Research

The scheme has enabled the institute to foster over 400 faculty members' involvement in a wide array of research initiatives, encouraging cross-disciplinary collaborations that can lead to groundbreaking discoveries and innovations.

Global Competitiveness and Recognition

IoE status positions IIT Madras to compete with the world's best universities, enhancing its reputation, attracting international students and faculty, and facilitating collaborations with top global institutions without bureaucratic hurdles.

Broader Institutional Growth

The IoE scheme supports not only research but also the holistic development of students, faculty, and infrastructure, fostering a vibrant campus culture and overall institutional excellence.

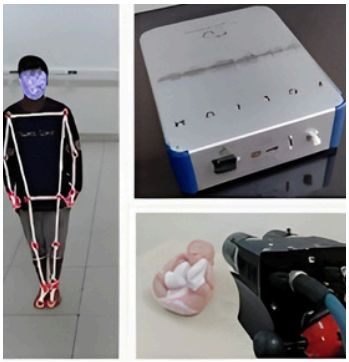
1. HEALTHCARE TECHNOLOGIES

Themes and Key Objectives

The Healthcare Technology Innovation Centre (HTIC) at IIT Madras is advancing affordable and accessible healthcare through cutting-edge R&D, clinical validation, and industry partnerships. Its technologies have impacted over 13 million patients globally.

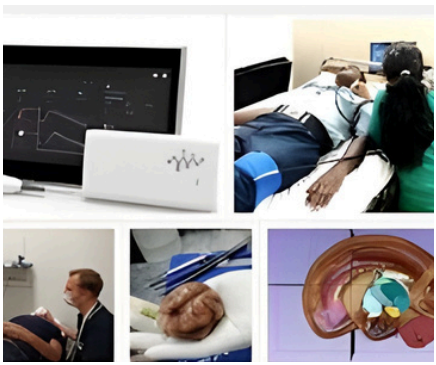
Current Focus Areas:

- Non-Invasive Vascular Assessment: Early detection using advanced diagnostics.
- Wire-Free Monitoring: Contactless sensors for continuous and home-based care.
- Intelligent Image-Guided Surgery: Real-time navigation to enhance precision and safety.



Significant Achievements/Outcomes

- **Translational Research Outcomes:** The Centre has achieved mapping the human brain, by releasing "DHARANI", the most advanced second trimester 3D-cell resolution human brain. The Centre has also accomplished developing the world's first device for comprehensive assessment of all non-invasive early vascular health markers.
- **Publications:** Two high-profile papers have been published, one in JCN published with a special editorial from the Editor, and one Nature paper. 10 papers have been published in neuroscience journals.
- **Patents:** Two technologies have been developed, one product has been commercialized, and one FDA filed device has been achieved. Nine new patents have been filed and four patents have been licensed.
- **International Collaborations:** There have been 10 International visiting faculty, including from New York University, Vanderbilt, and Romania.



Key Vision/Focus for the Future

The Centre has many plans for brain imaging, advanced cardiovascular technologies, Physio Sens: Next Gen Unobtrusive Health Monitoring, Biochemical Sensing Imaging, Intelligent Image-Guided Surgery, and Assistive Technology and Social Impact Tech for which funding is required.

The Centre hopes to raise funds over the next 10 years and is in advanced discussions for global licensing of their IP portfolio.

HEALTHCARE AND ASSISTIVE TECHNOLOGIES

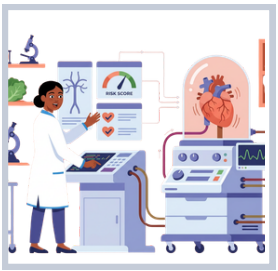
Impact & Innovation Snapshot

SDG ALIGNMENT

1 NO POVERTY | 3 GOOD HEALTH AND WELL-BEING | 4 QUALITY EDUCATION | 8 DECENT WORK AND ECONOMIC GROWTH | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 10 REDUCED INEQUALITIES

What's Next

- Scale MESUs to 100K+ surgeries/yr; infant monitoring to 100K+ babies/yr
- Build pan-India ecosystem: hospitals, NGOs, startups & policymakers
- Position R2D2 & NCAHT-IITM as global hub for affordable AT innovation
- 7 next-gen screening prototypes; 10+ adult brain mapping projects



Impact For Bharat

- 15,000+ users with enhanced mobility & independence
- Affordable AT replacing expensive imports; rural last-mile reach
- NCAHT-IITM (ICMR): experience zone, open innovation & AT prescription hub
- 12 districts in TN piloted infant monitoring; pan-India vascular study

Global Impact

- Scalable low-cost models for LMICs; export-ready AT products
- Clinical research in Europe + India (Radboud UMC, AIIMS, JIPMER, CMC Vellore)
- BRICS Neuroscience Symposium Q1 2026 — hosted by IITM (first time in India)
- International collaborations, patents & inclusive design advocacy

STARTUPS IN PLACE

Neomotion | Airtize Technology | Buzzark Simulations | C3 MedTech | Kornerstone Devices | Algorith Health | Kriyaneuro Technologies | Sonolight Imaging | ZBliss Technologies

STARTUPS IN PROGRESS

Thryv Rehab | ARTSENS® Plus — FDA 510k filed; licensed to US industry | 3 market-ready products: FBG interrogator, Spectrometer, Optofluidic biosensor | PhysioSens prototypes;

Asks for the future

₹20 Cr (NCAHT) + ₹20 Cr (R2D2); industry MfG & distribution partners; policy to integrate AT into healthcare & insurance; startup support for Neomotion, Thryv Mobility & Thryv Rehab

2. CENTRE FOR CANCER GENOMICS AND MOLECULAR THERAPEUTICS

Themes and Key Objectives

A multidisciplinary centre focused on discovering cancer biomarkers and understanding the genetic basis of cancers in Indian populations, including breast cancer, pancreatic adenocarcinoma, and paediatric leukaemia. The National Cancer Tissue Biobank (NCTB) at IIT Madras serves as a national repository of cancer tissue samples.

Key Objectives:

- Genome and transcriptome sequencing of pancreatic cancers in Indian cohorts
- Identification of novel mutations, gene fusions, and expression profiles for diagnostics and drug discovery
- Development of patient-derived tumour organoid models for personalized therapy

Significant Achievements/Outcomes

Translational Research Outcomes:

- India's first open access Cancer Genome Database: Bharat Cancer Genome Atlas (BCGA)
- Genomic landscape and gene expression profile for Indian pancreatic cancer cohorts.
- Development of non-invasive biomarker gene panel for early diagnostics, disease monitoring, treatment response and disease monitoring.
- Development of preclinical 3D organoid models for disease monitoring and drug screening towards personalized cancer treatment.
- Identification of novel drug targets for anti-cancer therapeutics.

International Collaborations

Collaboration with leading institutions across Australia, the USA, Italy, and the UK to advance cancer research, including genome studies and disease understanding. It also hosts CANCERCON, an international conference at IIT Madras, featuring 70+ global experts and 450+ participants. Notably, it is among the few conferences in India supported by leading journals such as Nature, Science, EMBO, and Cell.

Key Vision / Future Focus

- Industry Collaboration: Develop cancer gene panels and therapeutics using unique Indian genomic datasets
- Drug Screening Platforms: Advance 3D organoid models for studying tumour progression and personalized treatment

CENTRE FOR CANCER GENOMICS AND MOLECULAR THERAPEUTICS

Impact & Innovation Snapshot

SDG ALIGNMENT

3 GOOD HEALTH AND WELL-BEING

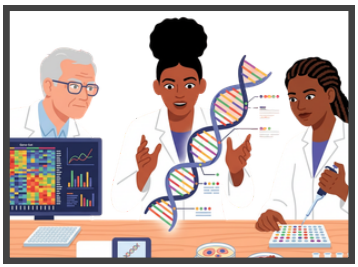
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

17 PARTNERSHIPS FOR THE GOALS

What's Next

- Expand cohort to breast, pediatric leukemia & colorectal cancers
- Launch cfDNA-based liquid biopsy clinical trials across Indian hospitals
- Scale BCGA to multi-cancer, pan-India genomic data
- Recruit 2+ faculty with cancer genomics expertise
- Advance PDO-based personalised drug screening to clinical validation

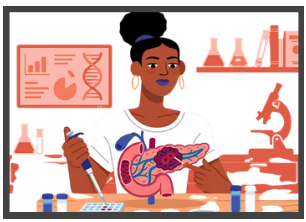


Impact For Bharat

- First Indian cancer genome atlas addressing the critical gap in population-specific genomic data
- Early detection tools tailored to Indian cancer subtypes (oral, cervical, breast — top killers in India)
- Reduced diagnostic delays and treatment mismatches for rural/semi-urban patients via precision tools
- Capacity building through CANCERCON and genomics training programs across Indian institutions

Global Impact

- Fills a major gap in global cancer genomic databases — Indian population previously underrepresented
- Novel pathogenic mutations (Beclin1, RBMX, SBS8) relevant to global pancreatic cancer research
- PDO-based drug screening model applicable to cancers worldwide
- Open-access BCGA empowers global researchers to develop targeted therapies for South Asian populations



3. CENTRE FOR SOFT AND BIOLOGICAL MATTER

Themes and Key Objectives:

The Centre studies the fundamental properties of soft matter—polymers, colloids, liquid crystals, and biological materials—through a multidisciplinary approach. These materials are vital to advanced technologies and biological systems due to their unique responsiveness and elasticity.

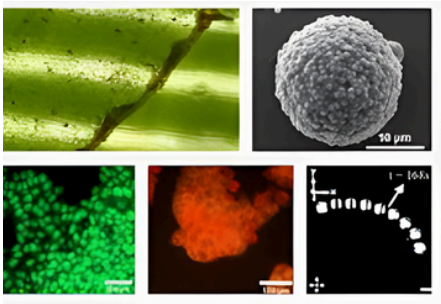
Key Focus Areas:

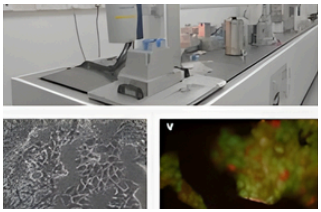
- Biological Matter
- Smart Sensors and Actuators
- Agriculture and Food Science
- Evaporation-driven Self-organization

The Centre also emphasizes training researchers and collaborating with academic and industry partners to translate research into real-world applications.

Significant Achievements/Outcomes

- Biological & Active Matter: Development of nanoarchaeosomes for breast cancer therapeutics; insights into rigidity and chirality
- Soft Robotics: Creation of stimuli-responsive actuators (vapour, solvent, temperature)
- Drug Delivery: Emulsion-based drug-loaded microgranules as an alternative to spray drying
- Food & Agriculture: Research contributions in soft matter applications for soil, plants, and food systems





Publications & Collaborations

- Publications: Over 2,080 publications between 2022–2025, compared to 1,776 during 2018–2021, reflecting significant research growth.
- International Engagement: Hosted seminars, workshops, and conferences featuring global experts on topics such as smart polymers, ion effects in soft matter, and DNA organization

Key Vision/Focus for the Future:

The Centre aims to undertake regular R&D projects, offer short-term training, and provide platforms for advanced testing and formulation development.

Future Focus:

- Applications in Healthcare, Food, and Agriculture
- Low-cost diagnostics and point-of-care devices
- Innovations in chemicals and pharmacology processes
- Agricultural formulations for enhanced field efficacy
- Technologies to address food adulteration
- Participation in initiatives like DBT-BIRAC ‘Smart Proteins’, Pfizer Technovation Challenge, and AGRO-TECH programme

CENTRE FOR SOFT AND BIOLOGICAL MATTER

Impact & Innovation Snapshot

SDG ALIGNMENT

2 ZERO HUNGER | 3 GOOD HEALTH AND WELL-BEING | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 17 PARTNERSHIPS FOR THE GOALS

What's Next

- Launch Soft Matter Consortium (Dr. Reddy's, Pfizer, HUL, Shell, ISRO, CavinKare)
- Scale stimuli-responsive soft actuator work toward soft robotics prototypes
- Expand food & agriculture research into precision formulations
- Pursue STARS, ANRF-SUPRA, DBT-BIRAC BioE3 grants
- Establish Phase III IoE funding request to Ministry of Education

Impact For Bharat

- Food safety: Sessile drop evaporation method to detect milk adulteration — low-cost, field-deployable technique relevant for Indian dairy supply chains
- Agriculture: Cellulosic mucilage studies improving understanding of seed dispersal and crop resilience; pesticide/fertilizer delivery optimization
- Affordable healthcare: Nanoarchaeosomes and emulsion microgranules enabling cost-effective cancer drug delivery for Indian patients
- Skill development: Short-term courses and training programs planned under the Soft Matter Consortium for industry personnel

Global Impact

- Chromatin organization models — insights into cancer biology and developmental disorders
- Soft robotics with energy-autonomous actuators relevant to medical devices & space (ISRO)
- Global collaborations: Oxford, Princeton, Columbia, KU Leuven, ETH Zurich, Sydney

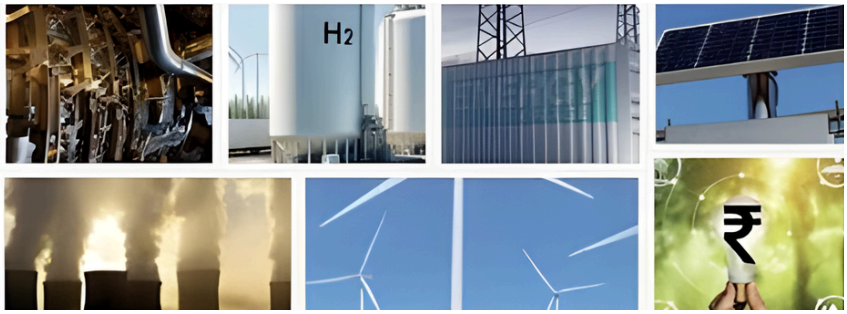
Asks for the future

Institute-level mechanism to route RBIC/IC projects as Centre projects; Phase III IoE funding from Ministry of Education

4. ENERGY CONSORTIUM

Themes and Key Objectives

The primary goal of the Centre is to Accelerate Net Zero. This is being achieved by advancing research in clean energy sources, including offshore wind, green hydrogen, green fuels, and large-scale industrial electrification, while intensifying its efforts in carbon capture, utilization, and storage.



Significant Achievements/Outcomes

- **Translational Research Outcomes:** The Centre has been involved in making Microgrids and Resilient Energy Systems, enhancement of renewable energy, production of advanced gas turbine engine technologies, energy storage and conversion in batteries, carbon capture, utilization and storage, and energy systems modelling and risk assessment.
- Incubated 7 Start-ups for translating the research outcomes
- **Publications:** There have been 380 publications so far in the time period 2023 to 2026.
- **Patents:** 37 patents have been acquired.

International Collaborations

- 28 Conferences and 10 International academic programs have been held.

Key Vision/Focus for the Future

An end-to-end value chain for Accelerating Net Zero through technology innovation, translation and policy action with a focus on translational research for real life industry applications and innovations. With 7 startups already emerging, the EC is pioneering translation of critical technologies from labs to market. With core focus of next horizon solutions including micro modular nuclear reactors, IITM EC will lead the world in successful scale up of critical technologies for net zero transition.

ENERGY CONSORTIUM

Impact & Innovation Snapshot

SDG ALIGNMENT

7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

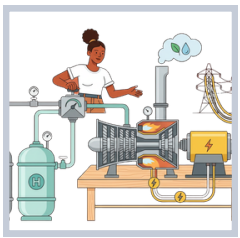
11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

What's Next

- Deploy flow batteries as long-duration storage in commercial/PSU sites via industry JV
- Build full-time leadership & operations team; EC as national energy testbed
- Deepen industry co-development; pursue equity in energy startups



Impact For Bharat

- Homegrown flow batteries — critical for India's energy security & indigenization
- Li-ion + thermal storage for net-zero buildings; zinc-ion batteries for rural electrification
- 97% cobalt recovery; ₹109.72 Cr ICSR funding mobilized

Global Impact

- Flow batteries for MWh/GWh grid-level storage globally
- CCUS at TRL 9/10 for cement, steel & chemical sectors
- Climate Action Tool (CAT) for global net zero planning

STARTUPS IN PLACE

Partnership with High Energy Batteries — indigenous flow battery development & deployment; JV/startup open to VC interest

STARTUPS IN PROGRESS

Flow battery JV/startup possible with VC supportIndigenous MWh-scale deployment capability established

Asks for the future

Partnerships with NTPC, SECI developers, Tata Power, State discoms & inverter suppliers; stable multi-year funding; dedicated physical space

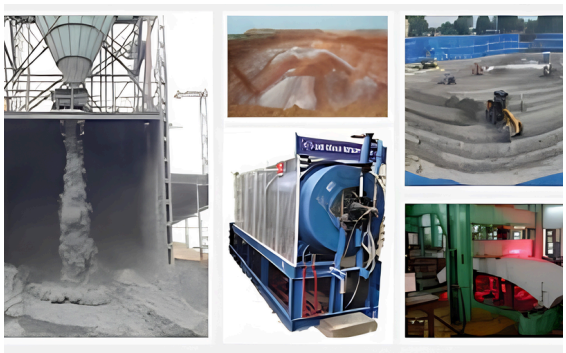
5. TECHNOLOGIES FOR LOW CARBON AND LEAN CONSTRUCTION

Themes and Key Objectives

The Centre develops low-carbon, lean construction technologies to reduce waste, promote circular economy practices, and minimize climate impact across the construction value chain.

Key Objectives:

- Utilize waste from construction, industrial, and agricultural sources to enhance durability and sustainability of concrete.
- Reduce material, cost, and time inefficiencies using lean methods, digital tools, and precast technologies.
- Develop policies to promote best practices and lower carbon footprint in construction
- Enable large-scale adoption through guidelines and policy recommendations.



Significant Achievements/Outcomes

Novel Scientific Outcomes

- Utilization and intelligent robotic segregation of C&D waste
- Development of low-carbon concrete (implemented in Ayodhya)
- Advancements in 3D printing for construction
- Use of VR for skill development and defect identification
- Research on health and safety in demolition processes
- Mentored 9 start-ups through the Centre

Patents, Publications &Collaborations

- **Patents:** Four patents filed and granted, including innovations in biomass ash cement, repair of post-tensioned systems, galvanic anode performance, and advanced cementitious grout
- **Publications:** 135 journal papers (2022–2025) aligned with UN Sustainable Development Goals, covering materials like biomass ash, limestone, and concrete
- **International Engagement:** Hosted 4 workshops with 30+ speakers from 14+ countries, 3 Young Researchers' Symposiums, the 10th International Conference on Concrete, and an outreach workshop at IIT Madras Zanzibar

Key Vision / Future Focus

The Centre aims to lead globally in low-carbon, lean construction technologies, minimizing waste across the value chain. It plans to establish India's first integrated testbed to assess agricultural, industrial, and C&D waste in concrete, shaping sustainable practices and policies.

Future plans include advanced facilities for concrete 3D printing, aggregate processing, and mechanical characterization.

TECHNOLOGIES FOR LOW CARBON AND LEAN CONSTRUCTION

Impact & Innovation Snapshot

SDG ALIGNMENT

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

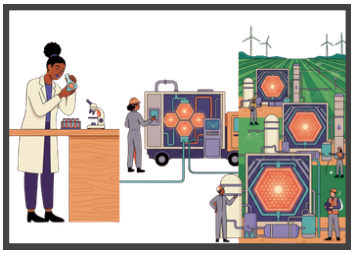
11 SUSTAINABLE CITIES AND COMMUNITIES

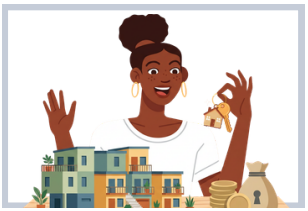
12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

What's Next

- Scale technologies from lab to field deployment
- Establish TLC2 Experience Centre (Thaiyur) as a national testbed
- Strengthen industry partnerships for adoption
- Develop standards for low-carbon materials and digital construction





Impact For Bharat

- Affordable, faster housing with reduced cost and time
- Improved safety, quality, and workforce training
- Job creation and waste reduction, supporting national missions
- Waste reduction → cleaner cities
- Supports national missions like Housing for All & Smart Cities

Global Impact

- Supports net-zero construction goals
- Reduces embodied carbon in infrastructure
- Scalable solutions for developing nations
- Enables climate-resilient construction

STARTUPS IN PLACE

3D Concrete Printing Tvasta | Construction automation & robotics | Sustainable materials (low-carbon cement, recycled aggregates) | Active collaboration with IITM incubated startups and industry partners |

STARTUPS IN PROGRESS

Digital Twin for construction lifecycle | AI-driven project optimization | Circular economy solutions (C&D waste upcycling) | Student-led innovation pipelines → incubation support underway

Asks for the future

Supports low-carbon construction policy and funding from pilot to scale, including test beds at Thaiyur, while fostering industry–government–academia collaboration and integrating advanced technologies into codes and curricula.

6. GEOPHYSICAL FLOWS

Themes and Key Objectives

Geophysical Flows Lab (GFL) is a global consortium of academic and industry researchers, adopting a unified approach to studying geophysical flows through field measurements, climate modelling, and laboratory studies.

While progress has been made individually in oceanography and modelling, GFL emphasizes a synergistic integration of these approaches. Its work focuses on:

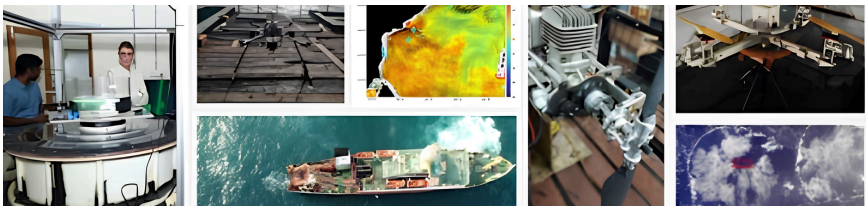
- Fine-scale field measurements
- Laboratory modelling of upper ocean physical processes
- Large-scale coupled ocean–atmosphere modelling

This approach improves understanding of air–sea interactions in the northern Indian Ocean, especially in understudied coastal regions

Significant Achievements/Outcomes

The Centre focuses on weather modelling, drone-based environmental monitoring (including ship-deployable UAVs), and particle dynamics. Field campaigns in the Bay of Bengal and collaboration with SAC-ISRO support sensor development, while technologies like hexacopter and QBiT have been transferred to industry.

- **Publications**: 34 international journal papers, with ~20% in collaboration with national partners
- **Patents**: 2 filed, 1 granted
- **International Collaborations:** Engagements with global experts, MoUs with the University of Massachusetts (USA) and ENS de Lyon (France), and international workshops including "MADRAS 2025"



Key Vision/Focus for the Future

- The Centre is executing a 5-year plan of intensive field campaigns to study sub-mesoscale coastal ocean dynamics, improving prediction of extreme weather like cyclones through fine-scale observations of oceans, atmosphere, rivers, and estuaries.
- A major focus is the development of long-endurance, extended-range UAVs with advanced sensors, deployed in swarms to complement in-situ and satellite data—requiring interdisciplinary expertise across engineering and earth sciences.
- Applications include coastal zone management, pollutant tracking, and climate monitoring. The Centre has already developed high-resolution drones for 3D atmospheric measurements and imaging.
- The long-term vision is to deploy next-generation drone swarms integrated with satellite systems for advanced environmental monitoring.

COE - GEOPHYSICAL FLOWS

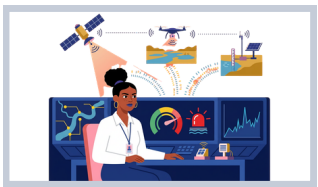
Impact & Innovation Snapshot

SDG ALIGNMENT

2 ZERO HUNGER | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 11 SUSTAINABLE CITIES AND COMMUNITIES | 13 CLIMATE ACTION | 14 LIFE BELOW WATER

What's Next

- Vision: To establish GFL with a scientific focus on Air-Sea-Land Interactions in Coastal Regions.
- Build GFL as a global CoE in coastal air–sea–land interactions
- Continue field campaigns
- Develop UAVs for environmental monitoring and Expand global collaborations
- Focus on water security and carbon cycle

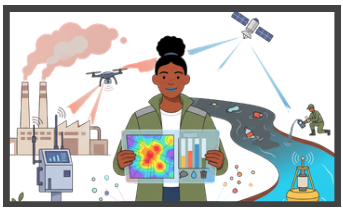


Impact For Bharat

- Improved forecasting of monsoons, cyclones, floods, and heatwaves
- Enables precision agriculture and crop monitoring
- Aids disaster response, search, and flood monitoring

Global Impact

- Supports coastal management, fishing zones, and pollution tracking
- Advances climate modelling and cyclone prediction
- Provides high-resolution data on land–ocean and monsoon systems



STARTUPS IN PLACE

Technology transferred to OEG Industries | Gust-agile hexacopter with 5 km altitude capability | 45-minute endurance and 2 kg payload | Deployed in coastal, ocean, and mountain region | Used for atmospheric profiling

STARTUPS IN PROGRESS

In-house UAV with 50 km range, 45 min endurance | 2 kg payload | Operates from ships and hilly terrains | Used for sea surface and land imaging | Developing advanced drone subsystems | Focus on variable pitch propellers and IC engines

Asks for the future

Rs. 5 crores for a three-year period, and Rs. 10 crores for a five-year period to sustain our current activities, and extend them towards large-scale deployment and in-house technology development.

7. MARITIME EXPERIMENTS TO MARITIME EXPERIENCE

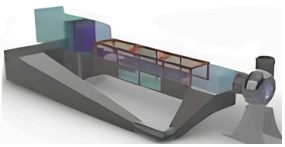
Themes and Key Objectives:

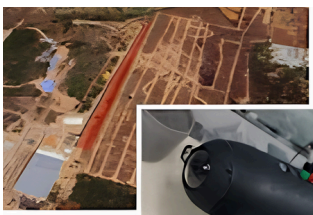
The Centre is a pioneering facility advancing marine structures and ocean technologies through interdisciplinary research and innovation. Its mission is to explore, understand, and protect oceans while addressing challenges in maritime autonomy, digital infrastructure, ocean analytics, and coastal/offshore design.
With mid-scale and proposed large-scale testing facilities, the Centre aims to transform ocean research and industry practices, supported by collaborations with leading global institutions

Significant Achievements/Outcomes

- In-house development of wavemakers and wave gauges
- Deployment of dredging project management systems and pilot tracking tools across ports
- Digital Twin for ports (pilot at Kamaraj Port)
- Indigenous Vessel Traffic Management System and e-Navigator app (commercialization underway)
- Deployment of autonomous surface vehicles
- Development of a circulating water tunnel








Publications & Collaborations

- **Patents**: 3 filed, including a semicircular breakwater integrated with OWC
- **Publications & Outreach**: 48 international publications, 2 books, 4 conferences, and 7 international research projects

Key Vision/Focus for the Future

The Centre aims to become a global hub for marine research and industrial solutions. Future focus areas include maritime cybersecurity, digital twins, next-gen e-navigation, smart ports, and autonomous vessels. It also plans to expand into Asia, the Middle East, and Africa, while fostering startups through a maritime innovation ecosystem. Key proposals are under discussion with the Ministry of Earth Sciences as part of the Deep Ocean Mission.

MARITIME EXPERIMENTS TO MARITIME EXPERIENCE

Impact & Innovation Snapshot

SDG ALIGNMENT

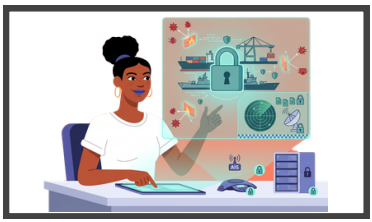
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

14 LIFE BELOW WATER

What's Next

- Maritime cybersecurity
- AI-enabled digital twins & e-navigation; smart ports (Port 4.0/5G)
- Autonomous underwater & surface vessels
- Hovercraft/amphibious systems



Impact For Bharat

- Vessel traffic systems deployed across major ports and waterways
- Improves safety, efficiency, and navigation
- Supports inland waterways and port operations

Global Impact

- 48 international joint publications
- Global collaborations and projects
- International conferences and research partnerships in maritime engineering

STARTUPS IN PROGRESS

Target of 1 startup (as per CoE rubric) | no specific names mentioned

Asks for the future

The initiative includes ₹32+ crore in ongoing projects, a ₹500 crore Maritime Innovation Hub proposal, and large flume projects ranging from ₹30–₹90 crore, alongside international research programs and expansion across Asia, the Middle East, and Africa.

8. CENTRE FOR NON-DESTRUCTIVE EVALUATION – INDUSTRIAL ASSETS AND PROCESS MANAGEMENT

Themes and Key Objectives

The CoE for NDE 5.0 advances ESG goals by improving safety, sustainability, and energy efficiency through cutting-edge sensing and diagnostic technologies. By enabling longer material life, higher reliability, and efficient industrial processes, it develops deep-research-driven NDE solutions for diverse sectors, with a vision to become a global leader in NDT technology translation.

Significant Achievements/Outcomes

- **Translational Impact:** 15+ startups employing 1,400+ professionals globally; notable names include Dhvani Research, Detect Technologies, Solinas Integrity, and Xyma Analytics
- Collaborations & Engagement: 45+ international interactions, 65 scholars (30 graduated), and partnerships with Accenture CoE OIE, GDC, and CAAR
- **Publications & Patents:** 170 IP filings (134 Indian, 36 international; 3 commercialized); 217 SCI papers and 65 conference papers (2021–2024)
- **International Exposure: E**ngagements with global organizations and delegations, including Saint-Gobain and teams from France and UK-Africa

Key Vision/Focus for the Future

The CoE is driving breakthroughs across multiple scientific areas, including:

- Super-resolution imaging using meta-materials (40× improvement)
- High-resolution distributed fibre optic sensing
- First-time use of quantum computing for ultrasonic wave modelling
- AI-augmented simulations achieving up to 1000× speed improvements
- Ultrasonic sensing in extreme conditions (up to 1400°C)
- Laser thermography for crack detection in hot metals (up to 1000°C)

Future Focus: Automated rail monitoring, smart buildings, quantum–AI integration, collaborative robotics, generative AI, blockchain, and advanced imaging technologies across ultrasonics and micro/nano-electronics

COE - CNDE

Impact & Innovation Snapshot

SDG ALIGNMENT

3 GOOD HEALTH AND WELL-BEING

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

17 PARTNERSHIPS FOR THE GOALS

What's Next

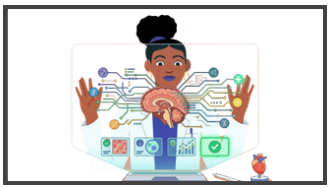
- Scale deep-tech NDE solutions from lab to industry
- Advance AI-driven inspection, edge intelligence, and robotics
- Expand into quantum, multi-modal sensing, and digital platforms
- Strengthen global collaborations
- Develop cost-effective, high-precision solutions

Impact For Bharat

- Improves safety & reliability of pipelines, railways, and power systems
- Reduces maintenance costs through advanced inspection technologies
- Supports Atmanirbhar Bharat through indigenous deep-tech innovation
- 1200+ professionals and researchers trained

Global Impact

- Delivers scalable, affordable inspection technologies
- Advances ultrasonics, imaging, and AI diagnostics
- Enhances safety standards and sustainability
- Enables global collaboration in NDE



STARTUPS IN PLACE

Dhvani Research | Detect Technologies | Planys Technologies | Maximl Solinas | Dhvani Analytic Intelligence | Dhvani Inspection Technologies | Xyma Analytics | Plenome | Rail Labs | Azeriri

STARTUPS IN PROGRESS

Azeriri | xeroscape | Plenome | Rail Labs | Folium Sensing | Matterise | Agalsearch | TIQWorld | BotForge | Automagri

Asks for the future

Funding for licensing technologies & training; extensive industry and global collaborations; development of National Consortium for NDE (NCNDE)

9. QUANTUM CENTRE FOR DIAMOND AND EMERGENT MATERIALS

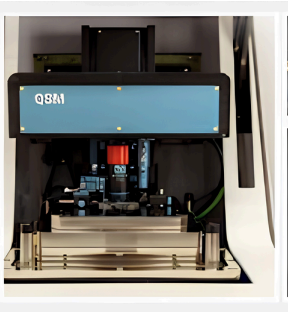
Themes and Key Objectives

The Centre focuses on quantum technologies, including diamond systems, photonics, quantum materials, superconductivity, and spin-based computing. Building on decades of theoretical work in superposition, entanglement, and topology, recent experimental advances now enable precise control and measurement of quantum states, making quantum technologies increasingly viable. Progress in material growth, defect engineering, and computational modelling is further enabling the development of advanced systems where quantum effects drive both fundamental research and emerging applications.

Significant Achievements/Outcomes

Established state-of-the-art infrastructure in quantum materials and diamond technologies, with progress in indigenization

- **Startup ecosystem:** 1 in pre-incubation, 3 expected within 2 years
- **Publications:** 120 high-impact papers; 7 conferences and 5 workshops conducted
- **Patents:** 1 granted, 4 filed
- **International Engagement:** Hosted the HFM Conference in India (300 participants, 125 international); visit by Prof. Igor Mazin (Bardeen Prize winner)



Key Vision/Focus for the Future

The Centre aims to establish a world-class Quantum Materials and Diamond facility, enabling quantum-material-to-device development. It focuses on cutting-edge applications in healthcare, including malaria diagnostics, cancer research, and diamond-based surgical tools.

Key Initiatives:

- Two directed projects on lab-grown diamonds and magnetic sensing, focusing on high-quality diamond seeds, quantum-enhanced magnetometry, and superconducting devices
- Target of 50 high-impact publications in areas such as quantum materials, quantum sensing, and spin liquids

QUANTUM CENTRE FOR DIAMOND AND EMERGENT MATERIALS

Impact & Innovation Snapshot

SDG ALIGNMENT

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

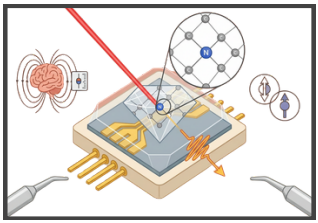
7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

17 PARTNERSHIPS FOR THE GOALS

What's Next

- Scale diamond-based quantum devices
- Build an integrated diamond-to-device ecosystem
- Advance sensing, imaging, and computing applications
- Expand quantum measurement and fabrication infrastructure



Impact For Bharat

- Enables indigenous quantum and diamond technologies
- Supports healthcare, communication, space, and sustainability
- Builds capacity through infrastructure and training

Global Impact

- Advances research in quantum materials and superconductivity
- Drives quantum sensing, imaging, and communication
- Develops scalable solutions for healthcare, energy, and space

STARTUPS IN PROGRESS

3 startups expected in 2 years | Directed projects expected to lead to startups in coming year or two | Tech transfer/start-up expected (quantum magnetometry)

Asks for the future

The initiative requires funding for hiring and internationalization, along with major investments in advanced facilities, lab infrastructure, and dedicated systems to support cutting-edge research

10. CENTRE FOR SPORTS SCIENCE AND ANALYTICS

Themes and Key Objectives

The Centre aims to be a global hub for innovation in sports technology, delivering solutions to enhance athlete performance and overall fitness. It focuses on indigenizing key sports products and services, while collaborating with bodies like the Sports Authority of India and federations to develop platforms for performance monitoring and biomechanics analysis.

The Centre also works on enhancing fan engagement through digital and media solutions, offers sports science education and coaching programs, and plans to establish an incubator ecosystem for sports tech startups, supported by expertise in data science, AI, IoT, and biomechanics.

Significant Achievements/Outcomes

The Centre has developed innovations across multiple sports, including technologies like DynaMode-NeRF (accepted at IEEE CVPR, USA). Ongoing projects include the Smart-Boxer and a Gait & Force Impact Analysis System, alongside the establishment of a Sports Tech Incubator fund.

Patents

Filed for the Smart-Boxer exercise platform and cricket performance analytics in collaboration with RCB

Key Vision/Focus for the Future

The Centre aims to advance sports, health, and wellness in India through technology, while supporting initiatives like the Olympics 2036.

Key Focus Areas:

- Launch courses in anti-doping, sports conditioning, nutrition, and certification programs via NPTEL/Swayam
- Develop 4+ applications/products for athlete performance within 3 years
- Build analytics and proprietary tools for live and post-match performance insights
- Introduce a sports management program in collaboration with partners
- Incubate ~25 sports tech startups annually
- Strengthen global collaborations and work towards recognition as a National Centre of Excellence

The long-term vision is to significantly contribute to India's international sporting success.

CENTRE FOR SPORTS SCIENCE AND ANALYTICS

Impact & Innovation Snapshot

SDG ALIGNMENT

3 GOOD HEALTH AND WELL-BEING | 4 QUALITY EDUCATION | 8 DECENT WORK AND ECONOMIC GROWTH | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 10 REDUCED INEQUALITIES | 17 PARTNERSHIPS FOR THE GOALS

What's Next

- Build SportsTech Consortium India Pvt Ltd for technology solutions at scale
- Support next-stage growth of sports tech products developed at IITM
- Direct CSR funds to sports impact areas
- Vision: support 200 sports tech startups in India by 2036

Impact For Bharat

- Data-driven training & real-time analytics enhancing athlete performance
- Affordable access to advanced sports technologies across institutions
- Promotes inclusion by supporting para-sports with specialized devices

Global Impact

- Global sports analytics using AI, computer vision & biomechanics
- Scalable low-cost sports technologies applicable across countries
- Innovations in sports medicine, injury prevention & performance science

STARTUPS IN PLACE

SportsTech Consortium India Pvt Ltd (IITM Pravartak incubated)

STARTUPS IN PROGRESS

SmartFeet | RacketX | Chess tech | POCUS | Computer Vision sports media analytics | Ball science (DRS/Hawkeye variants) | Grassroots coaching apps | Fitness & wellness aids

Asks for the future

Grant support via CSR funds and corporates; support through SAI/TOPS and IIS programs; direct corporate outreach for centre naming, parasports, EduSwasth, normative data; support for scaling IITM sports courses and platforms

11. CRITICAL TRANSITIONS IN COMPLEX SYSTEMS

Themes and Key Objectives

Many complex systems such as climate, power grids, financial markets, and ecosystems can undergo sudden critical transitions with severe consequences. The Centre focuses on understanding these phenomena and developing technologies to predict and mitigate their impact.

Key Objectives:

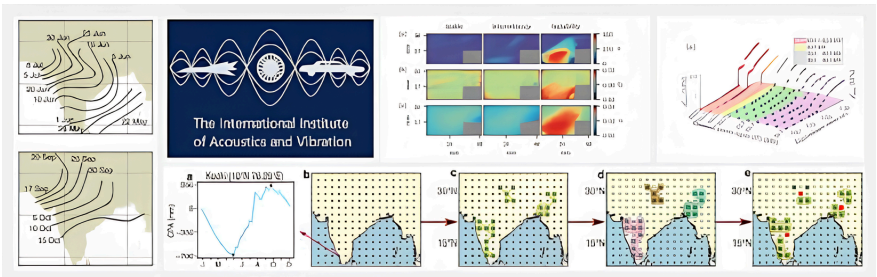
- Develop early warning tools for critical transitions and extreme events
- Mitigate impacts through smart control and system management
- Translate research into technologies, products, and start-ups
- Deliver global education through webinars, courses, and workshops

Significant Achievements/Outcomes

The Centre has made key breakthroughs, including redefining the onset of the Indian monsoon and advancing research in thermoacoustic transitions, complex networks, and turbulence. It has gained global recognition, including international affiliation with the US National Academy of Engineering.

Publications & Collaborations

- **Patents & Publications:** 6 patents granted; 78 publications in the last 5 years (31 with international collaborators)
- **International Collaborations:** Active global partnerships, projects, visits, and webinar series



Key Vision/Focus for the Future:

The Centre aims to deliver practical solutions to real-world challenges by translating transdisciplinary fundamental science into marketable technologies. Its work on predicting and managing critical transitions is expected to have high scientific and societal impact, helping mitigate future disasters.

The CoE focuses on advancing the study of complex systems across engineering and natural domains, including thermofluid instabilities, climate networks, and cloud microphysics, while securing funding for these areas. It also plans to establish a forecasting consortium involving startups, universities, IMD and other meteorological agencies, as well as banks, insurance, and financial institutions.

CRITICAL TRANSITIONS IN COMPLEX SYSTEMS

Impact & Innovation Snapshot

SDG ALIGNMENT

7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

What's Next

- Develop national early warning systems across key sectors
- Build sector-specific risk dashboards for decision-making
- Use AI/ML for prediction and scenario analysis
- Co-create policy tools with government and industry

Impact For Bharat

- Strengthens disaster preparedness and climate resilience
- Supports energy security and sustainable infrastructure (Viksit Bharat 2047)
- Enables data-driven policy and governance
- Builds skills, jobs, and empowers communities

Global Impact

- Contributes to global early warning and open science
- Supports climate adaptation and biodiversity conservation
- Promotes equitable, sustainable transitions

STARTUPS IN PROGRESS

Develop early warning products for extreme events and industrial failures | Build AI-driven platforms to predict system risks | Create testbeds with industry (energy, aviation, environment) | Incubate solutions for infrastructure sectors via IITM's ecosystem

Asks for the future

We seek collaboration in translational research and pilots, data partnerships and infrastructure, startup incubation and scale-up, policy engagement and capacity building, and global knowledge exchange.

12. MOLECULAR MATERIALS AND FUNCTIONS

Themes and Key Objectives

To build a sustainable centre with global visibility on molecular matter focusing on atomically precise clusters and gas hydrates.

Seed, nurture and expand cutting-edge science and technology in respective areas, collectively with the best people across the world, with the involvement of the next generation. They hold considerable academic and technological promise as they offer tunable properties, relevant for many applications.

The focus is on molecular materials, where the fundamental building blocks are molecules, rather than atoms. The Centre is working on two exciting new and important families of molecular materials:

1. Atomically precise metallic clusters
2. Gas hydrate cages

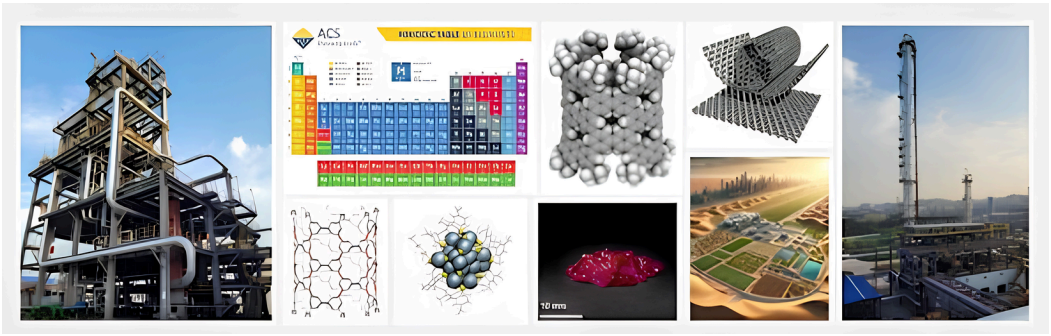
Significant Achievements/Outcomes

The Centre has made significant progress in atomically precise metal clusters (tens to hundreds of atoms), which exhibit properties distinct from both molecules and bulk materials. It is also advancing research on gas hydrates, including molecular cages containing CO_2 and CH_4.

The work has led to a strong knowledge base reflected in high-impact publications and societal applications such as arsenic removal for safe drinking water.

Patents, Publications & Collaborations

- **Publications & Outputs:** 73 publications, 5 books, and 14 patents filed/granted
- **Events:** Hosted an International Conference and Winter School on Molecular Materials and Functions, fostering global collaboration and discussions on emerging material properties



Key Vision / Future Focus

Breakthrough results are expected in this new class of molecular materials which will advance the field to new heights for innovations, and applications, and shape the future of scientific research and industrial development (reactivity, catalysis, electrical transport, magnetism, water harvesting, and energy storage, and molecular containers in cryogenic chemistry).

COE - MOLECULAR MATERIALS AND FUNCTIONS

Impact & Innovation Snapshot

SDG ALIGNMENT

What's Next

- Expand microdroplet chemistry for industrial applications
- Establish a RHEED unit for advanced structural insights
- Design next-generation nanocluster frameworks with tunable linkers
- Develop analytical tools for detecting emerging water contaminants

Impact For India

- Enable low-cost, energy-efficient electronic devices and sensors
- Improve access to safe drinking water across India
- Facilitate recycling of industrial and grey water
- Address India-specific technological and environmental challenges

Global Impact

- Nanocluster frameworks for sustainable electronics, data storage, and environmental sensing
- Microdroplet chemistry for efficient transformations (e.g., nitrate to ammonia) and nanoscale particle synthesis
- Affordable clean drinking water technologies with global impact
- Global leadership in structural elucidation via high-resolution Cryo-EM, with widely shared insights
- Prof. T. Pradeep chairs the IUPAC Committee on Clusters and Gordon Research Conferences on Clusters

STARTUPS IN PLACE

Nanocluster-based frameworks being explored for sensing, memory & energy devices | Scale-up of nanocluster synthesis for water quality testing applications | High-resolution Cryo-EM leveraged for device-grade quality control in early-stage commercialization

STARTUPS IN PROGRESS

MOFs for removal of Uranium & Selenium from drinking water — extending to startup partners in water sector | Microdroplet chemistry for industrial-scale production of technologically significant nanomaterials | Cryo-EM to confirm host-guest contaminant capture within MOFs at atomic level

Asks for the future

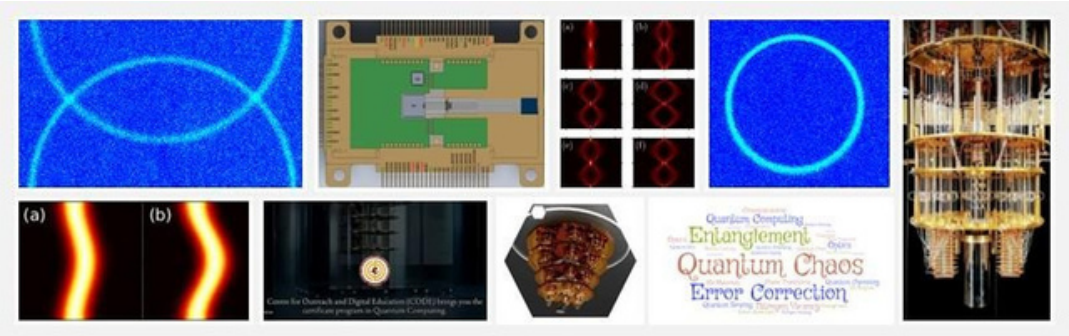
Support for scalable nanocluster synthesis & interdisciplinary collaborations; Cryo Lift-Out Workflow system to establish India's first atomic-resolution operando microscopy platform; creation of a National Materials Hub at IIT Madras (batteries, catalysis, semiconductors, energy harvesting, medical technology); national mission on cluster-based materials

13. QUANTUM INFORMATION, COMMUNICATION AND COMPUTING

Themes and Key Objectives

Quantum Technology is a key frontier at IIT Madras, driving the Centre for Quantum Information, Communication and Computing. The Centre advances secure communication, computing, and sensing through interdisciplinary collaboration. The Centre focuses and aims to

- Work on quantum key distribution, random number generation, sensing, metrology, and computing
- Integrate expertise across engineering, science, and management
- Focus on research, education, entrepreneurship, and outreach
- Develop technologies in photonics, optics, and qubits (TRL 1–5+)
- Achievements include quantum networks and 100-qubit IBMQ demonstrations



Significant Achievements/Outcomes

- **Translational Research Outcomes:** The Centre has incubated two startups, mentored two others, and secured an IP license. IIT Madras is part of the IBM Quantum Network, AWS Braket Cohort 2, and has access to D-Wave systems, strengthening its global presence and industry engagement as India's first IBM Quantum Hub.
- **Publications:** Over 44 scientific articles in three years, including 23 high-impact papers, with a steady target of top-tier publications.
- **International Collaborations and Achievements:** Hosted 15 international visitors, organized multiple global and national conferences, delivered 30+ invited talks, and conducted outreach including NPTEL courses.

Key Vision/Focus for the Future

The Centre, in the next 5 years, aims to generate Intellectual Property (IPs) and also incubate startups (likely numbers will be known after the end of the first 3 years). Seek to build 1000 Qubit Quantum computer aligned with National Quantum Mission Goal - The only one of its kind in the country.

QUANTUM INFORMATION, COMMUNICATION AND COMPUTING

Impact & Innovation Snapshot

SDG ALIGNMENT

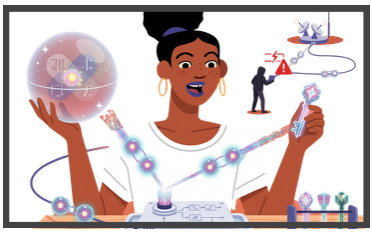
4 QUALITY EDUCATION

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

17 PARTNERSHIPS FOR THE GOALS

What's Next

- National Quantum Mission leadership
- NQM Hub on Quantum Communication
- Chennai–Bengaluru quantum network (550 km, 14 nodes)
- Reduce SWaP-C; photonic-electronic ICs

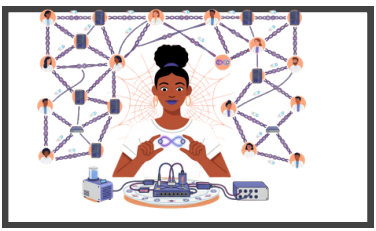


Impact For Bharat

- Indigenous quantum network tech (MAQAN)
- QKD protocols for secure communication
- MAQAN as public testbed
- PhD workforce development in quantum

Global Impact

- 15+ international visitors
- 40+ publications (22+ high-impact)
- 4 international + 3 national conferences



STARTUPS IN PROGRESS

Mentoring Quark itech | QuntrolSphere — to be incubated | Single photon detectors (WIP) | EPICs (WIP)

STARTUPS IN PLACE

Quanfluence (incubated) | Synprosoft (incubated) | 1 IP licensed to BEL (MDI-DPS-QKD)

Asks for the future

Sustained funding for MAQAN infrastructure, quantum communication network expansion, and post-doctoral hiring

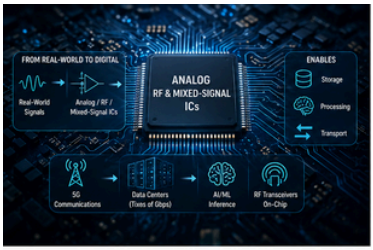
14. RF, ANALOG, AND MIXED SIGNAL ICS

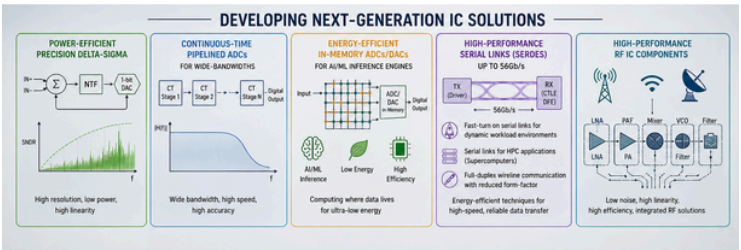
Themes and Key Objectives

Analog, RF, and mixed-signal ICs form the basis for converting real-world signals into digital form, and storing, processing, and transporting these signals.

Current Focus Areas:

- 5G integration, high-speed data transfer (tens of Gbps), and low-power AI/ML inference demand power- and area-efficient circuit design.
- A vital area bridging strong academic research with major industrial impact.
- Power-efficient ADCs (delta-sigma, pipelined, in-memory), energy-efficient high-speed SERDES (up to 56 Gb/s) for varied applications, and high-performance RF IC components.





Significant Achievements/Outcomes

- Data Converters - CT Pipeline ADCs, New data conversion paradigm, Analog Devices collab and Precision delta-sigma ADCs.
- RF Components - Frequency synthesizers-High performance for 5G, Broadband delay lines-For beamforming receivers, Spectrum sensors-EMI Sensors & Occupancy sensors for security.
- Serdes & Links - Clock multipliers, Rapid on-off links, Serial transceivers.
- In-Memory Compute - IMC chip in 28nm CMOS.

- **Publications:** Between 2021 and 2024, there have been 35 publications by the team. International collaborations through conferences such as ISSCC and ISICAS have been held. The Centre has also collaborated with international universities such as the University of Seville and Oregon State University.
- **Patents:** 11 Indian patents have been granted. Various technologies such as Continuous-time pipeline ADCs and RF system components have been achieved.

Key Vision/Focus for the Future

The Centre aims to further its research, publications and patent-filing and grants in the area of Data Convertors, RF Components, Serdes & Links and In-Memory compute.

COE- RF, ANALOG, AND MIXED SIGNAL ICS

Impact & Innovation Snapshot

SDG ALIGNMENT

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

17 PARTNERSHIPS FOR THE GOALS

What's Next

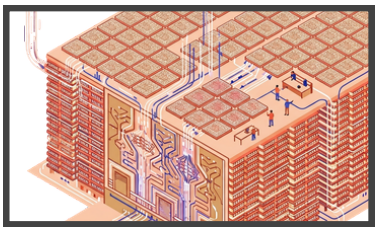
- Advance next-gen data converters, RF systems & high-speed circuits
- Scale in-memory computing for AI and edge applications
- Lead in 5G/6G hardware, beamforming & spectrum sensing
- Expand global academic and industrial collaborations

Impact For Bharat

- Supports India's semiconductor self-reliance
- Indigenous chip design for communications, sensing & security
- Contributes to national 5G/6G & electronics manufacturing
- Builds high-end talent in semiconductor design

Global Impact

- Advances analog, RF, and mixed-signal IC design globally
- Next-generation communication systems & high-speed data
- Scalable semiconductor technologies for AI & computing



Asks for the future

Industry partnerships for chip tape-outs and commercialization; sustained institutional investment in semiconductor fab access

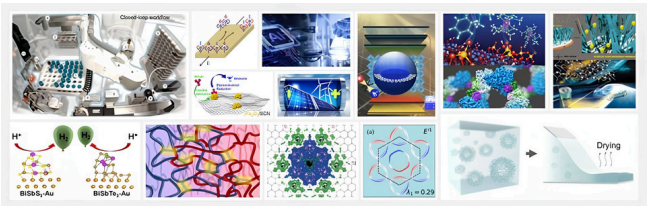
15. ATOMISTIC MODELLING AND MATERIALS DESIGN

Themes and Key Objectives

Innovation in advanced technology relies on discovering new materials through interdisciplinary research spanning physics, chemistry, and computational methods.

Current Focus Areas:

- AI/ML-driven materials design and virtual experimentation to reduce R&D cost and expand discovery space.
- Development of energy materials, high-entropy alloys, catalytic systems, and organic/hybrid photovoltaics.
- Quantum materials for next-generation information technologies.
- Creation of a unified materials database to uncover structure–property relationships and enable scalable, data-driven innovation.



Significant Achievements/Outcomes

- Technological Developments: India's first indigenous battery materials database (public prototype); quantum materials and polymer databases in progress; ultrathin noble metal films for electrodes, catalysts, and sensors; and substrate roughness reduction methods (all at TRL4).
- **Publications**: 170 journal papers in leading journals (Physical Review B, Nature, ACS, Journal of Energy Storage), including ~55 high-impact papers last year
- **Patents:** 5 filed, 2 granted; ~20 international collaborations
- **International Collaborations:** Strong partnerships with global institutions (Niels Bohr Institute, NTU, University of Florida, Purdue, NTU Taiwan, etc.) and industries (Pfizer, LAM Research, Saint-Gobain, A.O. Smith)
- **International Conferences and Workshops:** Conferences (2023, 2025), AI/ML workshop (2024, 83 participants), and global webinar (2023) with 400+ attendees

Key Vision/Focus for the Future

The Centre aims to become a global leader in materials research and is already India's largest interdisciplinary hub for computational materials science. It will focus on key domains such as energy, quantum technologies, sustainable materials, and electrochemistry, while strengthening global collaborations. The Centre is advancing virtual materials design by integrating theory, advanced computation, and AI, including plans for AI-driven autonomous labs. It is also developing a comprehensive, industry-relevant materials database combining experimental and theoretical data to serve as a national resource for research and innovation.

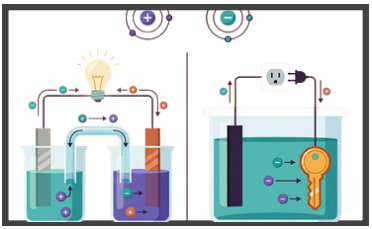
COE - ATOMISTIC MODELLING AND MATERIALS DESIGN

Impact & Innovation Snapshot

SDG ALIGNMENT

What's Next

- Focus on Energy, Quantum Science, Sustainable Materials, Electrochemistry
- Enhance global collaborations
- AI-driven autonomous lab in development
- Expand materials database to quantum materials and polymers



Impact For Bharat

- India's first and only database for battery materials
- Indigenously designed materials database — publicly available
- Hub for electrochemical energy storage research

Global Impact

- Collaboration with 20+ international researchers
- Joint research with Missouri, Colorado State, Columbia
- International conferences EESTER 2023, 2025

Asks for the future

₹9.6 Cr for 3 years; continuous IITM funding; technical support for patent filing; advertising and outreach support; possible additional space

OTHER CENTRES POWERED BY IOE SCHEME

CENTRES POWERED BY IOE SCHEME

CENTRE FOR ATMOSPHERIC AND CLIMATE SCIENCES

The Centre for Atmospheric and Climate Sciences (CACS) at IIT Madras, part of the Institute of Eminence (IoE) scheme, studies Earth system science and climate change in the Anthropocene. Its research team aims to understand atmospheric dynamics and mitigate the societal impacts of climate change.

Principal Investigator - Prof. Sachin S. Gunthe

EXTRA TERRESTRIAL MANUFACTURING (EXTEM)

A new centre - **ExTeM** has launched at IIT Madras to advance space-related manufacturing research in India. While current efforts focus on launch vehicles and satellites, there's a growing need to produce items in space for exploration and settlements. The centre will develop technologies for microgravity environments, including materials like concrete and metal foams. A multidisciplinary team will tackle space-based manufacturing challenges through research and technology development. Microgravity tests will use various platforms, aiming for international recognition and inspiring curiosity within the IIT Madras community.

Principal Investigator - Prof. Sathyan Subbiah

ADVANCED MEMORY AND COMPUTING

The Advanced Memory and Computing project at IIT Madras focuses on developing next-generation high-speed, non-volatile memory technologies (like PCM and RRAM) to overcome limitations of current semiconductor devices. It aims to enable faster, energy-efficient computing beyond traditional architectures by integrating advanced materials, device design, and novel computing paradigms.
The project also builds cutting-edge testing facilities and prototypes for future nanoelectronics, supporting applications in data-intensive systems like IoT and advanced computing.

Principal Investigator - Prof. Anbarasu M

CORRELATIVE MICROSCOPY FOR ENERGY RELATED MATERIALS

The Correlative Microscopy project at IIT Madras focuses on developing advanced tools to study materials at the atomic level, especially defect structures that current methods cannot fully capture. It integrates multiple microscopy techniques with a custom-built Field Ion Microscope to enable true 3D, high-resolution characterization of materials.
The project aims to build a comprehensive defect database and support the design of next-generation high-performance materials

Principal Investigator - Prof. Pradeep K.G

2D MATERIALS RESEARCH AND INNOVATIONS

Aim is to contribute significantly towards the development of 2D materials based disruptive science and technology starting from materials growth to high quality multifunctional devices.

Principal Investigator - Prof. Abhishek Misra

EXPERIMENTAL HIGH-ENERGY PHYSICS

To address questions about the matter in the universe and the forces that act between them. In particular, enhance participation in the international collaborations that we belong to, so that we can perform this research.

Principal Investigator - Prof. Jim Libby

GALLIUM NITRIDE RESEARCH AND DEVELOPMENT (GRAND)

This project develops e-mode GaN devices for power switching and amplifiers. Objectives include fabricating reliable e-mode GaN Fin MIS-HEMTs with high current drive, creating compact models for GaN circuits, designing test structures for model extraction, and characterizing device performance. It also involves designing passive components for power amplifiers, developing RF power amplifier MMICs using e-mode MIS-HEMTs, and designing 650 V e-mode Fin MIS-HEMTs for converters, followed by PA MMIC fabrication and characterization.

Principal Investigator - Prof. Amitava DasGupta

WATER AND SUSTAINABILITY

AquaMAP at IIT Madras advances sustainable water management through interdisciplinary research and collaboration. It develops scalable solutions, drives pilot implementations, and informs policy. The centre also engages stakeholders through training and capacity building.

Principal Investigator - Prof. Ligy Philip

FUNCTIONAL OXIDES RESEARCH GROUP (FORG)

The research focuses on advanced applications like energy storage, photovoltaics, and nanogenerators, developing eco-friendly materials through precise, physics-driven experimentation.

Principal Investigator - Prof. Pradeep K.G

ARCHITECTED MATERIALS DESIGN AND MANUFACTURING FOR NEXT-GENERATION ELECTRIC VEHICLES & HIGH-SPEED RAILWAY

This project focuses on designing architected multi-material systems that combine high-performance and low-cost materials to improve efficiency and performance in electric vehicles and high-speed rail. It develops lightweight, durable components such as power transmission systems, composites, and fuel cell materials using advanced design, optimization, and manufacturing approaches. The goal is to enable next generation mobility solutions with better reliability, energy efficiency, and cost-effectiveness.

Principal Investigator - Prof. Gnanamoorthy R.

SELF-ASSEMBLED MOLECULAR ARCHITECTURES WITH ISOLATED NANO-SPACE

The Self-assembled Molecular Architectures with Isolated Nano-space project at IIT Madras focuses on designing advanced molecular cages with confined nano-scale spaces for controlled chemical processes.
These structures enable applications like catalysis, sensing, and drug delivery by exploiting host–guest interactions within isolated nano-environments.
The work also explores multi-compartment molecular systems to study cooperative effects and create next-generation functional materials.

Principal Investigator - Prof. Dillip Kumar Chand

CENTRE FOR STRINGS, GRAVITATION AND COSMOLOGY

This centre focuses on advancing our understanding of gravitation and cosmology—from the early universe to black hole mergers—by bringing together theorists and phenomenologists to test fundamental theories.

Principal Investigator - Prof. Sriramkumar L.

VR & HAPTICS

CIXR at IIT Madras is an interdisciplinary hub for extended reality (XR) and embodied AI, driving research, prototyping, and startup creation. It develops indigenous XR technologies, testbeds, and real-world deployments across sectors like healthcare, education, and industry. Integrated with IITM's ecosystem, it aims to enable standards, commercialization, and global leadership in immersive technologies.

Principal Investigator - Prof. Manivannan M.

CENTRE FOR ADVANCED MICROSCOPY AND MATERIALS

The Advanced Microscopy and Materials project at IIT Madras focuses on designing next-generation materials (like advanced steels and 2D materials) using computational modelling and advanced synthesis techniques. It uses state-of-the-art microscopy to study materials at atomic scale, linking structure, defects, and properties to improve performance.
The goal is to develop high-performance, energy-efficient materials for applications in energy, infrastructure, and advanced technologies.

Principal Investigator - Prof. Sankaran S.

OPTOELECTRONIC CARBON NANOSTRUCTURES AND OLED DISPLAY LAB

The Research centre TINGE aims towards forming a comprehensive platform for material optimization, designing and fabrication of organic semiconductor based optoelectronic devices, particularly OLEDs. The novelty of the proposal lies in merging four related directions in designing emitters with best emission efficiencies and functionalities. The active materials for emission are carbon nanostructures, TADF semiconductors and perovskites. For novel multifunctional contacts moisture-protective coatings and multifunctional layers based on 2D materials are being investigated. Such a collaboration is one of a kind and a diverse institution like IITM makes it possible.

Principal Investigator - Prof. Jayeeta Bhattacharya, Prof. Debdutta Ray

MICROWAVE AND MILLIMETER WAVE STUDIES

Synthesize novel materials for microwave and millimeter wave applications. Design, fabricate and evaluate metamaterials to control absorption, polarization, and beam shape for microwave and millimeter wave applications.

Principal Investigator - Prof. C.V. Krishnamurthy

CENTRE FOR RESEARCH ON START-UPS AND RISK FINANCING

CREST at IIT Madras is an Institute of Eminence research centre focused on advancing knowledge of India's startup ecosystem through research, studies, and collaborations.
It generates data-driven insights to support policy formulation and practitioner decision-making.
Its global information platform integrates data across stakeholders, improving access and enabling high-quality research and entrepreneurship.

Principal Investigator - Dr. Thillai Rajan A.

CENTRE FOR OPERATOR ALGEBRAS, GEOMETRY, MATTER AND SPACETIME

Research spans geometric and quantum theory, including scattering, Lie groups, and operator algebras. It explores quantum systems, representations, and information channels.
Also focuses on string theory and non-perturbative quantum field theory.

Principal Investigator - Prof. Kunal Krishna

PHOTONIC INTEGRATED CIRCUITS

The main objective of the research centre is the development of the complete ecosystem for the realization of the system-in-packaged photonic chip for microwave applications (5G/6G, RADAR and satellite communications). In this regard, we investigate the key integrated photonic components such as modulators, photo-detectors, optical filters, optical true time delay lines, thermo-optic switches etc required for a microwave photonic circuit.

Principal Investigator - Prof. Bijoy Krishna Das

COMPUTER VISION

The purpose behind setting up this Research Centre is to work on cutting edge techniques in the area of Computer Vision with emphasis on multimodal learning and generative AI.

Principal Investigator - Prof. A.N. Rajagopalan

CYBERSECURITY CENTRE

The centre addresses the critical need for secure data in the age of big data, where sensitive information is increasingly at risk. It aims to bridge security and utility by building systems with strong mathematical guarantees that also support advanced applications like cloud computing. The work integrates cryptography, distributed systems, algorithms, and cybersecurity to create high-impact, trusted solutions.

Principal Investigator - Prof. Shweta Agrawal

MATERIALS AND MANUFACTURING FOR FUTURISTIC MOBILITY

The prospective centre of excellence aims to create innovative materials and revolutionary manufacturing solutions for cutting-edge e-mobility in land, air, and water transportation. This includes hydrogen and fuel cell powered vehicles, advanced high-speed railways with electromagnetic levitation, mass rapid transport systems, combat vehicles for defense purposes, and launch carriers for space applications, including hypersonic systems.

Principal Investigator - Prof. Murugaiyan Amirthalingam

INTERDISCIPLINARY SCHOOLS AT IITM

1. WADHWANI SCHOOL OF DATA SCIENCE & AI (WSAI)

Pioneering tech for the greater good

How We Are Driving This Impact

WSAI drives global leadership in AI by pioneering technology for the greater good, offering BTech, MTech, and PhD programs, and actively guiding policymakers on key AI and data science issues across India and beyond..

Our Approach

Eight integrated research verticals including Manufacturing Analytics, Financial Analytics, Systems Biology & Healthcare, Smart Cities & Transportation, Deep Learning, Reinforcement Learning, Network Analytics, and Responsible AI form the backbone of a comprehensive, interdisciplinary AI research ecosystem

Why It's Unique

The WSAI is the newest department at IIT Madras, and the largest AI department across all 23 IITs. It houses four dedicated research verticals with an aim to combine academic depth with real-world societal impact at a national scale.

Road Ahead

Next phases will focus on expanding research at scale, deepening industry and government partnerships, launching AI policy fellowships, and growing international collaborations, positioning IIT Madras and India as a global AI superpower.

Breakthroughs & Outcomes

It houses four dedicated research centres under one roof: CeRAI (Ethical and Responsible AI), AI4Bharat (AI technology for Indian languages), IBSE (centre for Integrative Biology and Systems Medicine), and RBCDSAI (Robert Bosch centre for Data Science and AI)

- AI4Bharat has built Indic language models now serving millions of users.
- CeRAI actively shapes India's national AI ethics discourse.
- IBSE advances precision medicine and cancer genomics.
- WSAI faculty publish regularly at top-tier venues, including NeurIPS, ICML, and Nature journals

Beneficiaries:

Students enrolled in BTech, MTech, and PhD programs at WSAI policymakers and industry partners benefiting from AI research, tools, and advisory outputs.

Duration: Ongoing (Since 2024)

2. DEPARTMENT OF MEDICAL SCIENCES & TECHNOLOGY (DMST), IIT MADRAS

Bringing Engineering to Life

How We Are Driving This Impact

Formally inaugurated on May 11, 2023, the Department of Medical Science and Technology (DMST) at IIT Madras bridges engineering and clinical practice by embedding clinicians into research and giving engineers a medical perspective.

It drives interdisciplinary PhD programs and fosters collaborations with hospitals and global partners.

Our Approach

At IIT Madras, MST/DMST adopts an interdisciplinary, problem-driven approach integrating engineering, medicine, and translational science to address unmet clinical needs. It develops scalable, real-world solutions across areas like AI in healthcare, medical devices, digital twins, robotics, drug discovery, and advanced therapeutics.

Why It's Unique

DMST at IIT Madras offers India's first four-year BS in Medical Sciences and Engineering, uniquely integrating medicine and engineering to train future physician-scientists. With strong hospital partnerships, it focuses on affordable healthcare innovation and end-to-end translation from research to real-world deployment.

Duration:

Ongoing Since May 2023

Road Ahead

DMST at IIT Madras aims to advance digital healthcare and precision medicine under the National Health Mission, while expanding lab-to-market translation, strengthening collaborations, training clinician-engineers, and accelerating medtech startups.

Beneficiaries:

Physician-scientists trained through the MD-PhD program, along with patients across partner hospitals like Sankara Nethralaya and MIOT International, benefit from DMST's work. Its innovations also serve clinicians, underserved communities, public health systems, and startups through scalable, tech-enabled healthcare solutions.

Breakthroughs & Outcomes

DMST at IIT Madras develops indigenous medtech solutions across diagnostics, devices, and digital health, with strong clinical validation, hospital collaborations, and pathways for startup creation and commercialization.

3. SCHOOL OF SUSTAINABILITY (SOS)

Go-to place for policymakers and researchers on sustainability

How We Are Driving This Impact

SoS drives integrated, interdisciplinary research on climate change, decarbonization, sustainable settlements, and behavioral change, collaborating with industry and policymakers to implement ground-level solutions and make IIT Madras a NetZero institution.

Our Approach

Four research verticals each spanning basic research, product development, pilot implementation, and policy advisory. Education is delivered through a Minor in Sustainability, Executive Education Program, and Joint Research Programs.

Why It's Unique

SoS uniquely combines teaching, research, and entrepreneurship under one roof, with dedicated programs accessible to students, industries, and policymakers alike.

Breakthroughs & Outcomes

- Carbon Zero Challenge has funded 100+ teams with over ₹5 crore, seeded 13 startups, and turned 42 researchers and 8 faculty into entrepreneurs.
- The Energy Consortium unites 50+ faculty across green hydrogen, carbon capture, energy storage, and renewable systems.
- Developing technologies for green shipping, coastal engineering, and future ports with plans to host maritime startups.

Road Ahead

An Integrated Dual Degree Program in Sustainability is planned within 3–5 years, alongside a sustainability incubator and expanded policy dialogues to accelerate India's low-carbon transition.

Beneficiaries:

Students, researchers, industry partners, policymakers, and eco-entrepreneurs supported through the Carbon Zero Challenge and INDUS DC programs pan-India.

Duration:
Ongoing (Since October 2023)

4. SCHOOL OF INNOVATION & ENTREPRENEURSHIP (SIE)

How We Are Driving This Impact

Launched on 4th August 2025, SIE was established to create a world-class deep-tech startup ecosystem and place IIT Madras on the global map of entrepreneurial universities.

Our Approach

SIE ties together an integrated I&E stack e-Cell, Centre for Innovation (CFI), Nirmaan pre-incubator, GDC, and IITMIC — ensuring smooth progress of ideas from conceptualisation to IPO, supported by IP clinics, fellowships, and business training

Why It's Unique

SIE uniquely combines practice-led degrees Minor in Entrepreneurship, MS(Entrepreneurship), PhD, and an industry-defined Innovation Doctorate with a first-of-its-kind Entrepreneur-in-Residence (EIR) cohort for returning professionals.

Breakthroughs & Outcomes

- 475+ startups valued at over ₹50,000 crore, creating 11,000+ jobs, 700+ patents, and ₹12,000 crore in investments.
- 104 startups incubated in FY 2024–25 alone, a historic first , spanning AI, space tech, biotech, defence, and quantum computing.
- GDC has trained 1,600+ academics and entrepreneurs across 500 deep-tech startups in collaboration with 100+ universities and labs pan-India.

Road Ahead

The IITM Alumni Fund, with commitments nearing ₹200 crore, will be deployed as a dedicated equity fund for IITM-incubated startups with a target of 1,000 startups by 2032.

Beneficiaries:

Students in Entrepreneurship programs; startup founders supported through Nirmaan, GDC, and IITMIC; faculty-entrepreneurs; and 11,000+ jobs created across the deep-tech ecosystem.

Duration: Ongoing (Since August 2025)

RESEARCH COLLABORATIONS FUNDED BY CORPORATES, CSR & PHILANTHROPY

RESEARCH EXCELLENCE

Powered by Corporate CSR Support

Partnerships at IIT Madras go far beyond funding they enable mission-driven research ecosystems that translate cutting-edge science into real-world impact. The Industry collaboration/CSR projects help drive societal impact at scale by addressing critical challenges such as affordable healthcare, MSME empowerment through AI, circular economy and energy transition, and assistive technologies. Thus ensuring research outcomes reach the last mile.

Corporate funding through Grants/CSR has played a pivotal role in advancing technology development for social good through:

- **Building Nationally Relevant Research Platforms**
- **Driving Deep-Tech Innovation with Industry Integration**
- **Accelerating Emerging Technology Leadership**
- **Creating End-to-End Innovation Pipelines**

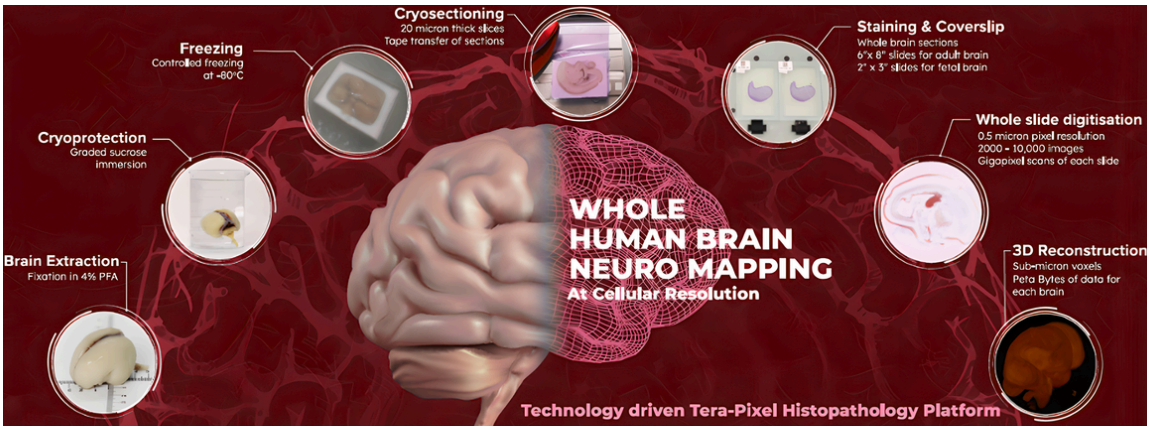
MODES OF CSR ENGAGEMENT

1. **Development of Research & Technology for Long-Term Impact**
   - Through Centers of Excellence
   - Via focused research projects
2. **Deployment of Technology for Scalable Societal Benefit**
   - Implementation through scalable programs
3. **Enabling Inclusive Access to Education, Skilling & Entrepreneurship**
   - Direct impact on underserved communities

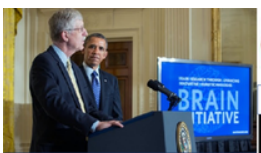
IIT Madras Brain Centre

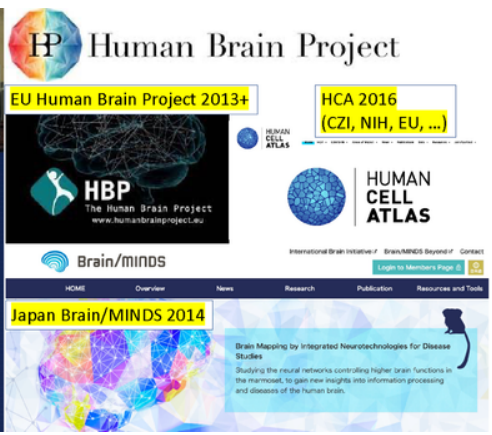
The Sudha Gopalakrishnan Brain Centre (SGBC) at IIT Madras is a multidisciplinary research facility integrating neuroscience, medicine, and engineering to study the human brain at sub-cellular resolution. Using advanced high-throughput imaging and large-scale data analysis, it generates massive datasets to understand brain structure, function, and disease. The centre aims to drive breakthroughs in brain research, therapeutic strategies, and AI-inspired innovations.

A Cutting-Edge Brain Research Centre combining Technology, Neuroscience, Medicine and Engineering
Developed an advanced World-Leading Human brain imaging technology platform



Global Context and our leapfrog to human brains directly...





We started in March 2020

Jumpstarted directly with **Human Brains**

On our way to create the globally first set of

100+

High-resolution Human Brain maps

70+

brains processed till date

300+

brains in pipeline
Fetal, Adult
Neurotypical, Pathological

Globally, less than 20 whole human brain data is available

Companies which supported Brain Centre

Dr.Reddy's | PREMJI INVEST | agilus diagnostics | ADITYA BIRLA HINDALCO

and many others

HYUNDAI HTWO INNOVATION CENTRE

The Hydrogen Innovation Centre advances research and development in hydrogen production, storage, and mobility to build a sustainable hydrogen ecosystem in India. One of India's first dedicated hydrogen innovation facilities at an academic institution, uniquely combining academia, industry, and government to build both cutting-edge technology and a skilled hydrogen workforce.

HYUNDAI HOPE FOR CANCER

The Pediatric Cancer Genomics Centre aims to map genetic mutations through sequencing to enable a national genome database and personalized cancer care for children. India's first open-access Cancer Genome Database (bcga.iitm.ac.in) covering paediatric leukaemia, colorectal, and pancreatic cancers — publicly accessible to researchers and clinicians worldwide, pioneering precision oncology for India.

CENTRE FOR CARDIOVASCULAR RESEARCH

The Cardiovascular Mechanics & Engineering Research Facility aims to address cardiovascular health challenges through engineering innovations. The Centre uniquely focuses on India-specific cardiovascular risk factors, combining digital twins, spatial genomics, and AI diagnostics identifying genetic drivers like DNMT3A mutations not captured by conventional cholesterol-based screening.

CENTRE FOR SUSTAINABLE SUPPLY CHAINS

The FedEx IITM SMART Centre drives global innovation and sustainability in logistics through advanced digital transformation technologies. FedEx SMEs are embedded directly into research reviews, addressing logistics challenges from carbon emissions to quantum computing, backed by real-world experiences like the Dubai gateway study visit.

WALMART CENTRE OF EXCELLENCE IN RETAIL ANALYTICS

The centre empowers MSMEs with AI-based manufacturing and retail analytics, driving operational efficiency and workforce upskilling. Exclusively Micro, Small & Medium Enterprises (MSME)-focused with open-source, democratized AI tools, making advanced technology accessible to businesses of all sizes.

CENTRE FOR RESOURCE EFFICIENCY, RECYCLABILITY & CIRCULARITY IN ENERGY TRANSITION

Focused on devising technologies for Resource Efficiency through recovery and reuse of metallic, non-metallic and plastic waste components extracted from batteries and solar panels

ROBERT BOSCH CENTRE FOR DATA SCIENCE AND AI

Founded in 2017, the Robert Bosch Centre for Data Science and Artificial Intelligence (RBC-DSAI) has a vision to expand and further the research, education and outreach activities in the areas of data science and artificial intelligence. RBC-DSAI carries out research in these two areas, and aims to become a world leader in data science research, where long-standing fundamental research problems across multiple disciplines are targeted and solved.

CENTRE FOR AI4BHARAT

AI4Bharat is dedicated to advancing AI technology for Indian languages through open-source contributions. Over the past, the lab has developed and released a wide range of datasets, tools, and state-of-the-art models. The focus areas of the lab include transliteration, natural language understanding, generation, translation, automatic speech recognition, and speech synthesis.

MCQUICC - QUANTUM COMPUTING HUB

The initiative aims to establish a Quantum Computing Hub that brings together industry, academia, and research labs, focusing on key areas such as quantum networks, computing, and information, while enabling advancements in basic research, applied research, and education.

ANATOMY LAB

World-class research environment for medical sciences and technology in order to develop and train Physician Scientists and Engineering Physiologists of the future of Medicine. A first-of-its-kind tech-enabled anatomy facility at an engineering institution, integrating medicine with engineering and serving UG, PG, and PhD students beyond its originally planned scope.

CENTRE FOR REHABILITATION RESEARCH AND DEVICE DEVELOPMENT (R2D2)

The initiative focuses on assistive technology device development, featuring innovations such as Arise, a unique three-wheel manual standing wheelchair with inbuilt mechanisms, and KADAM, India's first indigenously developed polycentric prosthetic knee joint, both aimed at enhancing mobility and independence for users.

INTERNATIONAL CENTRE FOR CLEAN WATER

The International Centre for Clean Water (ICCW) ideates and translates disruptive technologies in the pursuit of sustainable clean water. Key actions include building a strong network of scientific minds across academia and industry, nurturing technologies, incubating companies and tackling the socio-economic issues related to water at the grassroots level.

CYBER SECURITY LAB

The IDBI IITM Secure Systems Lab advances research and training in cryptography, blockchain, and secure systems to build next-generation cybersecurity solutions and expertise. An integrated cybersecurity lab combining research, systems development, and real-world deployment, enabling end-to-end solutions tailored to high-impact sectors and industry needs.

LAB FOR DATA ANALYTICS, RISK & TECHNOLOGY

Data Analytics, Risk & Technology (DART) Lab: Focuses on risk analytics, behavioural sciences, and tech platforms, advancing ML/AI-driven research on human decision-making, with support for scholarships and talent development.

PLANT CELL FERMENTATION LAB

India's first academic plant cell fermentation facility is being established at IIT Madras Research Park to enable sustainable, year-round production of high-value herbal bioactive compounds. With advanced bioreactor systems and interdisciplinary research, the lab supports academic projects and industry R&D, addressing critical supply gaps in the herbal and wellness sector.

CAMS IIT-M FINTECH INNOVATION LAB (CIFIL)

To Facilitate Research & innovation in the area of fintech to solve societal problems. India's first interdisciplinary fintech lab bridging Management Studies and Computer Science — uniquely converting academic research directly into market-ready fintech startups through structured incubation.

Funding for Research, Technology development and Socially Relevant Projects via CSR

CSR Project	Key Impact Area	Donor
KOTAK – IIT Madras SAVE ENERGY MISSION • A Pan India Industry Energy Assessment Cell Network	 Hub & Spoke Model - 30 Assessment Centers in IITs & NITs	kotak Kotak Mahindra Bank
Brain Centre • Digitizes entire human brains at micron-level resolution.	• Imaging entire human brains into ~10,000 slices of 20 microns each • Digitization at 0.5 µm in-plane resolution, producing petabyte-scale data volumes • A proprietary computational platform (in partnership with NVIDIA) for high-speed image processing and 3D reconstruction	HSBC, Aditya Birla Financial Services, Saint-Gobain, Bill & Melinda Gates Foundation, Dr. Reddy's, Fortis, agilus diagnostics, TVS
Robotic Innovation in Sanitation	• Innovation: Robot for homogenization and Cleaning of Septic Tanks	NSE Foundation
IOCL Projects	1. Pasumai Pudupet - Establishing and Operating a Micro Composting Center 2. Digital Technology Devices for Newborn Care 3. Establishing and Operating a Micro Composting Center (MCC) 4. Integrated Pottery Development Project in Tiruvallur District of Tamil Nadu 5. Providing Drinking Water in Indian Villages	इंडियनऑयल IndianOil
AQUAMAP	• Research Driven Design, Piloting, Protocol for Scalable Liquid Waste Management • Waste Water Management for Clean & Healthy Village Transformation	ITC Limited, aMADEUS
Nagapattinam Village adoption	3 'S' Focus: Solar Power, Safe Drinking Water & Sanitation in 600 Household benefitted in Villages in Nagapattinam	CPCL
Project Amrit (Uranium Removal)	The project is aimed to address the pressing issue of uranium contamination in drinking water in Ranbirpura village, Patiala, Punjab.	NIIF IFL Infrastructure Financing
Creating Climate Resilient and Sustainable Livelihood for Communities	Dharashiv - Maharashtra, Begu Sarai - Bihar : Develop and implement sustainable framework for addressing the challenges associated with non - linear impact of climate change Virudhunagar - Tamil Nadu: To unravel teleconnection patterns associated with extreme weather events and abnormal Indian monsoon. Develop prediction models based on the evolution of teleconnection patterns.	IndusInd Bank

INNOVATION & ENTREPRENEURSHIP ECOSYSTEM AT IIT MADRAS

VIBRANT STARTUP CULTURE & ECOSYSTEM

Guiding students to transform their ideas into a market-ready product.
End-to-end support across all stages of a startup

IIT Madras has built one of India's most dynamic innovation ecosystems, guiding the journey from ideation to scale. The **School of Innovation & Entrepreneurship** anchors this pathway, hosting platforms like **Nirmaan** and the **Centre for Innovation (CFI)** to empower students and entrepreneurs through mentoring, research translation, and hands-on innovation.

The **IITM Incubation Cell**, supported by sectoral incubators, drives early-stage and growth-stage ventures, serving as the nucleus for nurturing startups. Business mentoring, led by industry experts and the Gopalakrishnan-Deshpande Centre (GDC), fosters entrepreneurial mindsets, interdisciplinary collaboration, and leadership. With access to markets, industry partnerships, and capital, startups thrive within this ecosystem.

The **IITM Research Park** further bridges academia and industry, accelerating deep-tech ventures and enabling research-driven enterprises to mature.

The results are transformative: **457 deep-tech startups** valued at over **₹50,000 crore** have emerged, firmly establishing IIT Madras as a national leader in innovation and entrepreneurship.

THE INNOVATION & ENTREPRENEURSHIP ENGINE

Centre For Innovation

India's largest student-run innovation hub

A 24/7 innovation hub enabling students and startups with access, collaboration, patents, and global visibility.

60+ Current Projects in CFI	740+ People Involved in CFI	70 Average Footfall Per Day	15+ Startups from CFI
27 National & International Awards	10 Collaborations With NGOs	4 World Records Set by CFI	15+ Industry Projects in CFI

Competitive teams

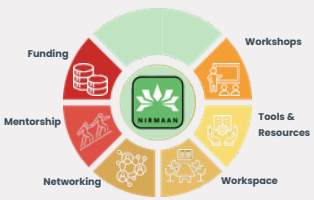
Team Anveshak · ABHIYAAN · IEEE · AMOGH · AGNIRATH · Abhyuday · Avishkar Hyperloop · iGEM

NIRMAAN

Incubating Innovation, Building Ventures

IIT Madras' pre-incubator providing a sandbox for young entrepreneurs to test and refine ideas.

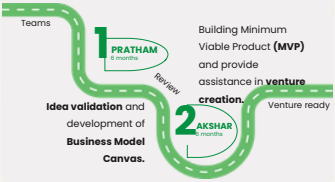
Nirmaan Offerings



NIRMAAN Highlights

Total Valuation 1000 Cr+	Revenue Generated by Startups 108 Cr+	Sectors in Focus 9+	Active Teams 88
Women Entrepreneurs 25+	Sustainability Focused Teams 40	Trained Teams 148+	Registered Startups 26

Pre-incubation Roadmap

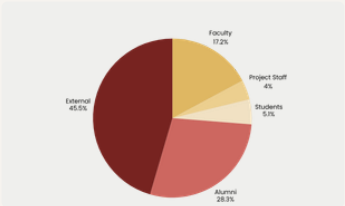


THE INNOVATION & ENTREPRENEURSHIP ENGINE

IITM Incubation Cell

From Incubation to Industry Leadership

IITM Incubation Cell drives innovation and entrepreneurship by integrating cutting-edge research, industry partnerships, the IITM Research Park, and a strong track record in rural, social, and industrial tech incubation.

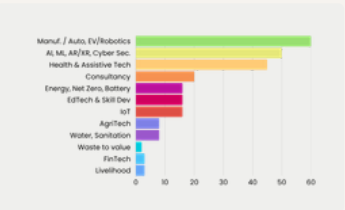


400	192 Graduates 132 Incubation	Investment by Angel/Vcs 12000Cr +	50000cr
150 STARTUPS IN MARKET	3600 Cr Revenue	10000+ Jobs Created	Patents Filed 210

IITM Research Park

Bridging research and enterprise

- A cross-border hub for faculty, students, and industry collaboration and innovation.
- IITMRP drives IIT Madras' impact by nurturing scalable, innovative, and commercially successful solutions



Achievements

70+
R&D Partners across 17 sectors

400+
Startups Incubated across 13 sectors

200+
Labs & Test Facilities

1300+
Patents Filed

INCUBATION SUPPORT GRANTS

Industry collaboration is a powerful catalyst for student entrepreneurship at IIT Madras. Through CSR-supported incubation grants, leading corporates enable young innovators to transform ideas into deployable technologies by supporting prototyping, testing, and real-world validation. Beyond funding, startups gain access to industry environments, technical expertise, and market linkages bridging the critical gap between research and commercialization, and accelerating the journey from lab to market.

Pathways: Innovation to Incubation program by Citibank

This is an ambitious initiative to strengthen India's deep-tech startup ecosystem by supporting student entrepreneurs in transforming research-driven ideas into scalable ventures. Focused on critical sectors such as Agritech, Cleantech, and Fintech, the program enables early-stage startups through funding, intensive mentoring, and structured incubation support. It also builds entrepreneurial capacity across institutions by extending IIT Madras' proven incubation model to multiple technology institutes, fostering a nationwide culture of innovation.

Innovation & Incubation Program supported by American Express

Designed to nurture early-stage student entrepreneurs by addressing critical gaps in pre-incubation and deep-tech innovation, this program is implemented through the School of Innovation & Entrepreneurship, Nirmaan, and the IIT Madras Incubation Cell. Through a structured selection process, selected teams receive mentorship, training, and resources to develop technology-driven, scalable solutions aligned with the UN SDGs, enabling them to progress from early innovation to incubation and beyond.

HDFC Bank Parivartan

This initiative plays a pivotal role in advancing startups toward deployment and commercialization. Supported ventures have demonstrated strong progress from system development and pilot validation to industry adoption and early market traction reflecting the power of sustained CSR support in building scalable, impact-driven enterprises.

Including Aptiv, BMW Tech and many others

NOTES

Collaboration with IIT Madras

Modes of Engagement

SO	**Social Impact -** Invest in socially impactful & relevant projects through IITM
C	**Consultancy, Sponsored research -** Carry out sponsored research & consultancy along with IITM, both through CSR & as a commercial partnership
I	**Incubation & Investment -** Partner with IIT Madras to incubate impactful technologies and products
E	**Endowments & Scholarships -** Provide scholarships & endowments for students in IITM
T	**Training -** Upskill employees at IIT Madras in cutting edge fields like AI, ML, and data science
Y	**Youth Placement -** Employ the young graduates of IIT Madras

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