JAN - MAR 2024

RESEARCH & DEVELOPMENT NEWS

IIT GANDHINAGAR

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COVER STORY

In the first quarter of this year, IIT Gandhinagar undertook a series of significant industry-relevant initiatives, demonstrating its commitment to fostering collaboration between academia and the industrial sector. The institute conducted workshops to impart advanced technical skills and knowledge to students and professionals. Two major industry-related events were held: CoLab, IITGN's Industry Open House and the India-Japan Innovation Symposium.

CoLab 2024, conducted on March 2, 2024, hosted more than 200 participants from various industries, start-ups, and academic and research institutions. The Open House was a platform for industry professionals and researchers to glimpse IITGN's research prowess, network with faculty members and students working on various cutting-edge domains, and find joint domains for collaborations. The event also hosted visits to various labs and facilities, talks from leading industry and academic experts, panel discussions in Healthcare & Pharmaceuticals, Manufacturing, Energy, AI, Defense, etc., and an interdisciplinary research showcase.

Japan's New Energy and Industrial Technology Development Organization (NEDO) and the IITGN Innovation and Entrepreneurship Center (IIEC) conducted the **India-Japan Innovation Symposium** on March 11, 2024. The event drew approximately 150 participants, including 70 external delegates, and aimed to cultivate opportunities for meaningful partnerships and strengthen the ties between IITGN and Japanese industries, academic institutions, and government bodies. The symposium also featured a 36-hour hackathon, Hack the Future: Revolutionising Smart Transportation, organised by IIEC and sponsored by NEDO.

PROJECT FUNDING

PI/Mentor	Discipline	Project Title	Agency Name
Uttama Lahiri	Electrical Engineering	Extension and Digitalisation of Indian Aphasia Battery (IAB)	Biotechnology Industry Research Assistance Council - Biotechnology Ignition Grant Scheme (BIRAC - BIG)
Atul Bhargav	Mechanical Engineering	Demonstration of a Novel Compact, Lightweight 10 kWe Fuel Cell based Power Pack Platform for Unmanned Aerial-surveillance Applications in Frontier Areas	Defence Research & Development Organisation (DRDO) - (Extramural Research & Intellectual Property Rights)
Karthik Pushpavanam Subramaniam	Chemical Engineering	Engineering Next-Generation Biopolymers for Effective Removal of Heavy Metal Ions in Water: A Protein Engineering Approach	Department of Biotechnology (DBT)
Harish Palanthandalam Madapusi	Mechanical Engineering	Experimental Investigation of the Intermittent Strategy Employed by the CNS in the Control of Quiet Stance in Young and Elderly Healthy Individuals	Department of Science & Technology - Cognitive Science Research Initiative (DST - CSIR)
Sharad Gupta	Biological Engineering	Proteomics and Mass Spectrometry Facility	Department of Science & Technology - Fund for Improvement of S&T Infrastructure (DST - FIST)
Sharad Gupta	Biological Engineering	Targeted Protein Degradation of TDP-43: Target Validation and Development of Therapeutics against Triple Negative Breast Cancer	Gujarat State Biotechnology Mission (GSBTM)
Karla Patricia Mercado-Shekhar	Biological Engineering	3D Printed Tissue Engineered Islet Transplant System (3D - PITS) - Influence of Extrinsic Factors and Microenvironment for Protecting and Enhancing the Viability and Functionality of Differentiated Islet-like Clusters	Indian Council of Medical Research (ICMR)
Joycee M Mekie	Electrical Engineering	Secure and Energy-efficient Mixed Domain Compute in memory-based AI accelerator Chip for Edge applications	Ministry of Electronics and Information Technology - Chips to Startup (C2S) Programme
Pranab Kumar Mohapatra	Civil Engineering	C - NARMADA	Ministry of Jal Shakti - National River Conservation Plan
Sudhanshu Sharma	Chemistry	Developing a Coke-resistant Biogas Reforming Catalyst using a Comparative Approach of Supported and Substituted Metal Oxide	Science & Engineering Research Board - ASEAN India Science & Technology Development Fund (SERB - AISTDF)
Kabeer Jasuja	Chemical Engineering	Developing a New Class of Chemical Sensors by Investigating the Semiconducting Properties of a New Family of Boron-based Nanosheets (XBenes) Derived from Layered Metal Diborides	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Udit Bhatia	Civil Engineering	Network-of-Network Lens to Quantify Structural and Dynamical Aspects of Resilience of Coupled Infrastructure Systems	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Sameer G Kulkarni	Computer Science & Engineering	Decentralized Security Orchestration and Management with Programmable Networking and Artificial Intelligence	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Vikrant Jain	Earth Sciences	Defining River Health of Dryland Rivers by Developing a Process-based Hydro-geomorphic Model	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Raghavan Ranganathan	Materials Engineering	Towards Next Generation Ultra-strong and Ultra-tough Light-weight Protective Biomimetic Composites: Inspiration from Nacre and Dactyl Club	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Pradipta Ghosh	Materials Science And Engineering	Precipitate Stability and their Significance on the Mechanical Properties of (NiCoCr) (TiAl) Multicomponent AlloysZ	Science & Engineering Research Board - Core Research Grant (SERB - CRG)

Sanjaykumar Hansraj Amrutiya	Mathematics	Quotients in Algebraic Supergeometry	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Harish Palanthandalam Madapusi	Mechanical Engineering	Learning-based Controller that Stabilises Unstable Robot-end-point Interactions with the Environment: Algorithm Development and Hardware Validation	Science & Engineering Research Board - Core Research Grant (SERB - CRG)
Chetan Devkishin Pahlajani	Mathematics	Multiscale Analysis for Switching Markov Processes	Science & Engineering Research Board - Mathematical Research Impact Centric Support (SERB - MATRICS)ZZ
Jayaprakash K.R.	Mechanical Engineering	Dynamics and Acoustics of Piecewise Linear Structures	Science & Engineering Research Board - Mathematical Research Impact Centric Support (SERB - MATRICS)
Prasanna Venkatesh Balasubramanian	Physics	Measurement-induced Phase Transitions under Collective Dissipation	Science & Engineering Research Board - Mathematical Research Impact Centric Support (SERB - MATRICS)
Subramanian Sankaranarayanan	Biological Sciences and Engineering	Understanding the Role of Plant U-box E3 Ligases in Pollination	Science & Engineering Research Board - Start-up Research Grant (SERB - SRG)
Karthik Pushpavanam Subramaniam	Chemical Engineering	Development of a Microfluidic Platform for On-Demand Bio-Manufacturing Through List Assisted Protein Purification	Science & Engineering Research Board - Start-up Research Grant (SERB - SRG)
Rajkrishna Dutta	Earth Sciences	High-pressure-temperature Behavior of (Mg, Fe)2GeO4: Analogues for Silicates of Deep Exoplanet Interiors	Science & Engineering Research Board - Start-up Research Grant (SERB - SRG)
Pankaj Khanna	Earth Sciences	Assessment of sequestering CO_2 in Deccan Basalts in Gujarat and Western Maharashtra	Adani Power (Mundra) Ltd.
Uttama Lahiri	Electrical Engineering	Digitisation and Automation of Corneal Cross-linking Device	Biotech Vision Care Pvt. Ltd.
Krishna Prasad Miyapuram	Computer Science and Engineering (jointly with Social Sciences)	Testing the Efficacy of Neurofeedback in Cognitive Skills and Mental Wellness.	CerboTech Education Pvt. Ltd.
Vimal Mishra	Civil Engineering	Climate Change Risk Assessment of Flooding on Gwaliar-Jhansi Highway (ToT13)	National Investment and Infrastructure Fund
Shailesh R Gandhi	Civil Engineering	Compliance Audit for Fly Ash Disposal/Utilisation	DCM Shriram Ltd.
Vimal Mishra	Civil Engineering	Hydro-Geomorphic Analysis of Vadnagar Watershed Area	Directorate of Archaeology and Museums, Govt. of Gujarat
Shailesh R Gandhi	Civil Engineering	Flyash Audit for Coal-based Thermal Plants as per CPCB Guidelines	Electrotherm India Ltd.
Sriharitha Rowthu	Materials Engineering	Feasibility Study to Fabricate ZnO Blocks in an Indigenous Manner	Elmex Controls Pvt. Ltd.
Pallavi Bharadwaj	Electrical Engineering	Low Inertia Grid Solutions Review	Enotrac UK Ltd.
Amit Arora	Materials Engineering	Development and Optimisation of Friction Stir Channeling Process to Design Cold Plate	Epsilon Engineering Pvt. Ltd.
Udit Bhatia	Civil Engineering	Consultancy for Intake Well Capacity Expansion at GIDC Pumping Station Rundh	Gujarat Industrial Development Corporation (GIDC)
Shailesh R Gandhi	Civil Engineering	Ash Bond Certification and Advising at GNFC, Bharuch	Gujarat Narmada Valley Fertilizers & Chemicals Limited (GNFC)
Ravi Sadananda Hegde	Electrical Engineering	Development of Smart Boxer Software	Indian Institute of Technology Madras (IITM)
Deepak Singhania	Humanities and Social Sciences	Zambia Fiscal Decentralisation	London School of Economics and Political Science (LSE)
Chinmay Ghoroi	Chemical Engineering	Fire-resistant Nano-composite Preparation	M/s Ocean Marine Environment Coatings Pvt. Ltd.
Gaurav Srivastava	Civil Engineering	Assessment of Implications of Vibrations due to Piling Work on Nilambaug Society Buildings at Chainage 502.654 KM of HSR Alignment	National High Speed Rail Corporation Ltd. (NHSRCL)
Ajanta Sachan	Civil Engineering	Geotechnical Investigations for Two High-rise Buildings to be Constructed at NID Campus	National Institute of Design (NID)
Soumyadip Sett	Mechanical Engineering	Feasibility of Surface Engineering Coatings for Aluminum Milk Containers to Prevent Adhesion of Residual Milk	Prompt Innovations Pvt. Ltd.
Tarun Kumar Agarwal	Electrical Engineering	Design of Terahertz Band On-chip Signal Generator for Future Wireless Systems for 6G	Qualcomm Technologies Inc.
Amit Prashant	Civil Engineering	Stability of Piles for Orsang Aqueduct Structure with the Proposed Protection works after Significant Scouring	Sardar Sarovar Narmada Nigam Limited
Saumyakanti Khatua	Chemistry	Optical Fibre-coupled Portable Spectrometer-based Colour Measurement of Raw Diamond and Comparison with Existing Method	Shree Ramakrishna Exports Pvt. Ltd
Udit Bhatia	Civil Engineering	Solution to the Problem of Water Ingress and Seepage in the LHS 35 and 36 Constructed by Indian Railways in the City of Gondal	Western Railway

AWARDS AND FELLOWSHIPS

Prof Sivapriya Kirubakaran, Associate Professor, Chemistry, was bestowed with the **Alumni Excellence Award** by Ethiraj College for Women, University of Madras, as part of their 75th-anniversary celebrations.

Prof Srinivas Reddy, Guest Professor, Humanities and Social Sciences, was awarded a **Fulbright Academic and Professional Excellence Award** and will be in India for the 2024-25 academic year.

Camellia Biswas, PhD Scholar, Humanities and Social Sciences, received the **Cultivating the Humanities and Social Sciences Research Grant** to support a four-month project from her PhD thesis.

Prasanth P Nair, PhD Scholar, Mechanical Engineering, was selected for India's Science and Engineering Research Board (SERB) **Overseas Visiting Doctoral Fellowship Program (OVDF)** at Purdue University.

Camellia Biswas and **Ahana Ghosh**, PhD Scholars, Humanities and Social Sciences, were awarded the

prestigious **Indian National Trust for Art and Cultural Heritage (INTACH) Research Scholarship** for 2023-24.

Satadru Chakrabarty, PhD Scholar, Chemical Engineering, bagged the first prize in the **Indian National Young Academy of Science (INYAS) Saransh: Three Minutes Thesis Competition 2023** in the engineering sciences category.

Vysakh R, PhD Scholar, Humanities and Social Sciences, received the **Harvard-Yenching Fellowship** for 2024-25 for one year of doctoral study at Harvard University.

Ishrat, MTech Student, Mechanical Engineering was awarded the **Reliance Foundation Postgraduate Scholar Award**.

Prof Harish PM, Associate Professor, and **Prof Madhu Vadali**, Assistant Professor from the Department of Mechanical Engineering, visited Tohoku University, Japan, to explore collaborative opportunities through the **Sakura Science Exchange Program**. They were accompanied by PhD scholars **Barat S**, **Suraj Borate**, and **Saumya Karan**, and MTech student **Ishrat**. During their visit, the team worked with the Space Robotics Lab to address various robotics-related challenges.

CONTINUING EDUCATION PROGRAMME (IITGN-X)

Event/Program Name	Event Date	Discipline/Centre/Institute and Funding Agency
Workshop: High Energy Physics Phenomenology (WHEPP XVII)	January 02 - 11, 2024	Organised by IITGN (Convener) in collaboration with members from multiple institutions and with funding from the Tata Institute of Fundamental Research
e-Master's: Energy Policy and Regulation	January 7, 2024 (two-year program)	Program offered by IITGN
Focus School: Geotechnical Infrastructure Design (GID)	January 8, 2024 (14-week program)	Organised by IITGN-X
Workshop: Computing Education Week- Computing Research in Curricula: Knowledge, Education & Training (CRiCKET): Building Imagination with Knowledge Exchange	February 03 - 05, 2024	Organised jointly by IITGN and Gujarat Council on Science and Technology (GUJCOST), with funding from GUJCOST.
Residency: Art and Cognition Confluence	February 10 - 11, 2024	Organised by the Curiosity Lab, IITGN with funding from the Cognitive Science Society (CSS).
Workshop (for School Teachers): An Introduction to Indian Mathematical Heritage	February 12-14, 2024	Organised by IITGN with sponsorship from the History of Mathematics in India **(HoMI) Project, IITGN** and the **Indian Knowledge Systems** (IKS) division of the Ministry of Education, Government of India
Workshop: CNC Milling Workshop: Crafting Precision	February 24, 2024	Organised by the Machine Shop, Department of Mechanical Engineering, IITGN
Workshop: Enhancing Energy Efficiency in MSME Industries	February 26, 2024	Organised by IITGN under the under the IITGN - Kotak IIT Save Energy Mission (KISEM) energy assessment activity, a CSR initiative by Kotak Mahindra
Workshop: Mapping Archaeological Heritage in South Asia (MAHSA) QGIS, Survey Planning, and ODK Training Programme	February 26 - March 01, 2024	Organised by the Archaeological Sciences Centre, IITGN in collaboration with Cambridge University, with funding from ASI.
Industry Open House: CoLab 2024	March 2, 2024	Organised by IITGN
Workshop: Unlock Your Creativity: CNC Wood Crafting workshop	March 02, 2024	Organised by Machine Shop, Department of Mechanical Engineering, IITGN
Workshop: Metal Casting: Lost-wax Technique in Archaeology	March 02 - 03, 2024	Organised by the Archaeological Sciences Centre, IITGN with funding from ASI.
Workshop: Current Trends in Active Matter Physics	March 7, 2024	Organised jointly by IITGN with funding from the Department of Science and Technology under the BRICS STI Framework Programme
Workshop: Mathematics Teachers Orientation Camp (MTOC) 2024	March 11 - 15, 2024	Organized and funded jointly by IITGN with Homi Bhabha Centre for Science Education (HBCSE)
Workshop: Designing Learner-Centric MOOCs	March 16, 2024	Organised by IITGN's Design and Innovation Centre in collaboration and with funding from the Training Cell of the Directorate of Technical Education
Workshop: 5G Use Case Labs: Awareness and Pre-commissioning Readiness,	March 18-19, 2024	Jointly organised by IITGN and the Department of Telecommunications (DoT), the National Telecommunications Institute For Policy Research, Innovation, And Training (NTIPRIT), Ministry of Communication, GoI; with funding from DoT and NTIPRIT.
Symposium: IEEE South Asian Ultrasonics Symposium	March 27 - 29, 2024	Hosted by IITGN with funding from IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society (USA).

PATENTS

Title	Inventors	Status
A System for Performing Minimally Invasive Surgery (Mis)	Vadali, Venkata Madhukanth Firdaus, Mohammad Modassir	**Filed**
Fluorescent Styryl Compounds and a Process for its Preparation	Gundimeda, Venkata Sriram Kanvah; Rajput, Deeksha	**Filed**
Film Composition and a Process for its Preparation	Prachi Thareja; Manjot Singh; Manasi Jinugu	**Filed**
Phenothiazine Derivatives and a Process for their Preparation	Kirubakaran, Sivapriya; Thiruvenkatam, Vijay; Gaurav Rai; Bhanu Priya	**Filed**
Additive Manufacturing Using Selfcompacting Concrete	Kumar, Manish; Shekhar, Shashank; Mathur, Rishabh	**Granted**
Carrier for Anti-Cancer Drugs and a Process for Preparing the Same	Ghoroi, Chinmay; Chaudhary, Jai Prakash; Varghese, Sophia	**Granted**
An Apparatus for Cancelling Acoustic Feedback and Method Thereof	George, Nithin V; Somanath, Pradhan; Patel, Vinal	**Granted**
A Cool Flame Reactor for Diesel Reformer	Bhargav, Atul; Bhakta, Sagardeep	**Granted**
Photochromic Organic Compounds and a Process for Preparation Thereof	Appayee, Chandrakumar; Padmaja, Venkata Mani Duppalapudi	**Granted**

MoUs

ASIAN INSTITUTE OF TECHNOLOGY (AIT), THAILAND

An MoU was signed between IITGN and AIT to strengthen the relationship between the two institutions by developing collaboration through academic, research, capacity building, training, and faculty development activities. The two signatories also signed MoAs to jointly develop dual degree programs for postgraduation and PhD. Further activities to be undertaken under the ambit of the MoU include developing joint academic programs, undertaking collaborative research projects; organising seminars, workshops, and conferences; creating staff/faculty development programs; and short-term student mobility programs.

UNIVERSITY OF SAN DIEGO (USD), USA

IITGN and USD have committed to developing joint academic, research, and capacity-building programs. These include a double master's degree program; a BTech-MTech dual degree program; joint executive education programs; joint incubation and entrepreneurship activities, seminars and conferences, and staff/faculty development programs; and short-term student programs for education camps or internships to facilitate a two-way exchange of students and research scholars.

NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR (NITJSR), JHARKHAND

IITGN and NITJSR signed an MOU to facilitate academic and research collaboration in areas of mutual interest, including the exchange of students for the summer research internship programme (SRIP) at IITGN; opportunities for a semester-long study initiative and Start Early PhD programme at IITGN; research opportunities for NITJSR faculty members at IITGN, etc.

GRADUATE SCHOOL OF SCIENCE TOKYO METROPOLITAN UNIVERSITY, JAPAN

IITGN and the Graduate School of Science, Tokyo Metropolitan University, entered a MoU to promote academic and research cooperation through joint projects, seminars, conferences, and educational activities and facilitate exchange programs for academic staff and students.

CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH), USA

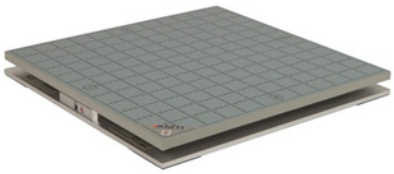
An MoU was signed between IITGN and Caltech to promote research and cultural exchange programs between the two institutions. The exchange will allow IITGN students to carry out individual research projects with Caltech faculty mentors as part of the SURF program. Caltech students will be able to participate in a cultural exchange trip with IITGN organised by the Caltech Y. The program melds research with cultural awareness, adding new dimensions to the student's academic experience.

MAJOR FACILITIES

MULTI-AXIS FORCE PLATFORMS

(Model: AccuSway-Optimized (ACS-O) Force Plate by Advanced Mechanical Technologies Inc.)

The ACS-O force plate measures the centre of pressure, forces, and moments. It is a portable device that can be used for balance assessments, training, and estimating ground reactions during walking. It is capable of measuring forces (moments) up to 1000 N (34 Nm) in the vertical and 150 N (181 Nm) in the remaining directions.



The instrument is installed in the Human-Centered Robotics (AB 04, Room 111). For further details, please contact Professor Vineet Vashista (vineet.vashista@iitgn.ac.in).

METABOLIC CONSUMPTION SYSTEM

(Model: COSMED K5 Wearable Metabolic Systems by Global Medical Devices Inc.)

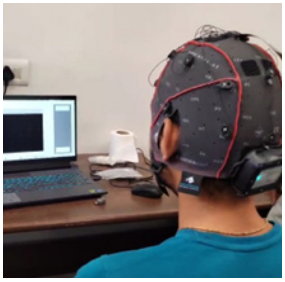
The COSMED K5 is a portable mixing chamber telemetry metabolic analyser used to assess human performance by measuring oxygen uptake. Its portable unit, powered by a rechargeable battery, consists of a 3.5" touch-screen LCD, O_2 and CO_2 analysers, a sampling pump, a transmitter, barometric sensors, and electronics. The device, by measuring oxygen uptake during physical activities, could aid in developing training programs, assessing their impact on athletes, studying the efficacy of rehabilitation therapies, etc.

The instrument is installed in the Human-Centered Robotics (AB 04, Room 111). For further details, please contact Professor Vineet Vashista (vineet.vashista@iitgn.ac.in).

G.NAUTILUS RESEARCH

(Model: g.Nautilus 16 g.SCARABEO by g.tec medical engineering GmbH)

g.Nautilus RESEARCH is a biopotential amplifier with wireless data transmission technology with active wet electrodes (16 channels). The device can acquire biosignal data with 24-bit resolution and a sampling rate of 500 Hz. It also has a 3-axis acceleration sensor that can sense ±6 g. The tiny and lightweight biosignal amplifier is attached to the g.GAMMAcap to avoid cable movements and to allow completely free motions. Wearable EEG headsets and biosignal acquisition devices are becoming increasingly important in medical and clinical environments.

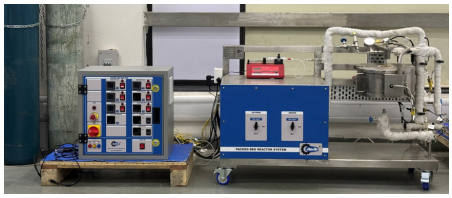


The instrument is installed in the Human-AI Interaction Lab (AB 13, Room 317). For further details, please contact Professor Yogesh K Meena (yk.meena@iitgn.ac.in)

TUBULAR BED REACTOR SYSTEM

(Model: T112 by Amar Equipment Pvt. Ltd.)

This reactor is used to study methanol partial oxidation reactions. It is constructed from SS 316 L and has a volume of 22 mL, capable of operating at temperatures ranging from 500 to 600°C. Additionally, it is outfitted with a PDC (Amar Equipments, No-6) and Mass Flow Controllers (Bronkhorst, F-201CV-100-AGD-22-V, No-2) to regulate the temperature and gas flow rates.



The instrument is installed in the Green Catalysis Group (AB 5, Room 205). For further details, please contact Professor Abinaya Sampath (abinaya.sampath@iitgn.ac.in).