INDIAN NATIONAL ACADEMY OF ENGINEERING

E-Newsletter

Vol. XVII, Issue 2, June 2026

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INAE VISION 2020-2025

INAE VISION

To be the premier Engineering Academy of the World providing timely inputs to the national and international policy makers, and to extend appropriate assistance in developing engineered solutions for the challenging problems facing contemporary societies and the humanity as a whole.

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INAE Mission

To serve professionals in building and institutionalizing engineering and technological excellence in education, research and industry in India and support advancement of engineering profession globally

Technology Roadmap

We are living in exciting times. We will have to contend with the profound transformation of our society and our industry, because of two revolutions in the making – namely, the digital revolution and the impending transition to fossil fuel free energy globally.

The digital revolution is rapidly transforming the very nature of industrial enterprise today. Many disruptive transformations are maturing rapidly because of the advent of cloud computing and internet of things (IoT) and due to major advances and breakthroughs being made on several fronts such as artificial intelligence (AI) including machine learning (ML) and big data analytics, robotics, autonomy, drones, 3D printing, advance sensors and 5G technologies.

Another revolution in the making is the exciting possibility of fossil fuel-free generation of electricity in the coming decade. The availability of electricity based on renewable sources such as sun, wind and biomass, will cause a major disruption as well as an opportunity for creating a cleaner world, since use of fossil fuels (coal, oil or natural gas) currently, creates deleterious environmental consequences which need urgent attention.

While both these revolutions will cause major disruptions in how we live and work, the transition to the new world in the making is contingent upon the availability of new sources of critical raw materials.

Both digital hardware and generation of electricity from renewables (including the technological challenges associated with energy storage) require a host of new metals and materials for which the new value chains (also the appropriate global supply chains) will have to be established. Innovative processes for extraction of minerals and metals as well as recycling, which are more energy efficient and environment-friendly will have to be developed to produce these critical elements.

To facilitate this global transition, we need to create human resources with high level of domain expertise in different facets of engineering as well as the much needed engineering skill sets needed to deal with the problems of scalability, uncertainty, reliability, complexity, system engineering, ability to deal with variability and yet manufacture products and create solutions of uniform and reproducible quality, capability to design, develop and optimize engineering systems for a given set of inputs and for a desirable set of assured outputs of consistent quality.

Our engineering education has to be appropriately re-engineered so as to equip our future leaders with not only the domain expertise but also the skillsets to innovate continuously and consistently in the face of constant change and dynamic transformations. The human ingenuity and the preparing the well-trained minds, will be critical ingredients in responding to the challenges ahead.

It in this context, INAE has come up with the following areas for our focused attention in the next five years. We believe that these efforts will assist us in facilitating the smooth transition to the new world in the making.

1. **Accelerated Discovery, Development and Deployment of Novel Materials, particularly for strategic sectors like Defense, Atomic Energy and Space.**

We have an urgent need of materials (metals, alloys as well as composites) development for the following sectors – auto sector (both electric vehicles as well as IC engines based vehicles), aerospace, ultra-supercritical power plants, nuclear power plants, renewable energy sector (novel PV materials, rare earth magnets, battery materials for both large scale energy storage as well as for electric vehicles and other electronic appliances, thermoelectric materials for converting low temperature heat into electricity), novel sensors for healthcare industry, materials for the defense applications and space applications, to name a few.

These materials will have to engineered for India-specific applications. That means one must consider during the process of design & development itself, the kind of natural resources we have and the kind of supply chains we will be able to establish to source the starting raw materials, considering the complex geo-political scenario and vulnerabilities associated with dependence on raw materials from abroad.

The other important consideration is the speed of development. In order to remain globally competitive in this domain, we must leverage the state of the art digital platforms (equipped with advance modeling, simulation, data analytics and knowledge engineering tools) for accelerating the development cycle from conception to deployment in actual applications as well as the entire life cycle (cradle to cradle or cradle to grave in some cases), that is, even for the structural health monitoring of the structures where these materials will be deployed.

Another important consideration is the environmental impact of these materials, that is, we must undertake a life cycle analysis, both with respect to the environmental footprint as well as the energy efficiency (actual consumption as compared to the thermodynamic energy needed to accomplish the particular task), for every developmental effort.

It is now well established that integrated computational materials engineering (ICME) approach can help accelerate the materials development cycle.

INAE will work towards coming up with a national strategy to establish and institutionalize the ICME based approach for all material development efforts. The digital platform, thus created, must be equipped with knowledge engineering capabilities so that it can not only act as a knowledge repository of all past efforts made thus far but also continues to update the knowledge going forward.

2. **Strategies for Energy Transition to Fossil Fuels free Renewable Energy Sources**

It is inevitable that India, like several other nations of the world, will move away from fossil fuels as a source of energy. While we have made some headway in developing renewable energy sources like solar and wind, the necessary infrastructure to support the energy transition does not exist at the present time.

INAE plans to create an interdisciplinary expert group to study the whole energy transition comprehensively and holistically, keeping in mind the challenges inherent in such a massive transformation.

INAE will focus on the following important sectors which will be disrupted in the immediate future and/or the areas of concern which we require a strategy for, urgently to facilitate the transition

- Large scale energy storage solutions - Solutions other than Lithium Ion Batteries which do not seem to be appropriate for a country like India for a variety of reasons including the fact that we do not have the basic raw materials - Liquid Metal Flow batteries (for example, Vanadium Flow Batteries) is another attractive option which must be explored.
- Electricity Grid Infrastructure - current grid will not be able to cater to intermittent and distributed electricity inputs; the concept of smart grids which is adequately robust to cater to both supply side challenges (renewable energy sources) as well as demand management (dynamic pricing to take care of its peak loads).
- Transportation (electric mobility, both for people as well as for goods).
- Mining, Mineral Processing and Extractive Metallurgy Industry (which currently depends totally on fossil fuels not only as a source of heat but also as a reductant to convert metal oxides to metals).
- Recycling of waste by-products including municipal waste, tailings and smelter slags including steel slag, red mud and spent pot lining, electronic waste and hospital waste.
- Supply chains for raw materials needed for the transition - sourcing strategies from other geographies, urban mining, deep sea mining and space mining.
- Finding alternative technology options for the manufacture of steel and cement to reduce the environmental foot-print - currently these two materials which will continue to remain the backbone of the Indian economy for the foreseeable future and the consumption is likely to increase by an order of magnitude in the coming decade.
- Waste-water treatment and recycling.
- Water purification technologies including desalination

3. Excellence in Engineering Education

Several groups including other academies globally, are working on the new curricula for engineering education so that our young emerging leaders are adequately equipped with necessary engineering skill sets to face the challenges in the coming decades.

Various deliberations within India as well as abroad have emphasised the need of providing hands-on design experience, problem solving skills and exposure to the systems engineering concepts, tools and technologies to the engineering students. The curricula also need to be updated with the advancements in digital technologies.

All engineers must be familiar with the sustainability paradigm and must be able to do life cycle analysis for every engineering product. They must be equipped with knowledge and the experience with various digital platforms and modelling tools such as computational materials engineering (all the way from atomistic scale to macroscopic scale), computational fluid dynamics, structural analysis tools, life cycle analysis modelling tools, engineering scale up, robust design methodologies to take care of uncertainty and complexity, machine learning and data analytics tools and algorithms, multi-objective and multi-variate optimization tools and technologies.

It is important that the professional ethics is part of the engineering course curricula. A multi-disciplinary systems perspective to all engineers will certainly broaden their horizons – much needed to face the emerging world scenario. Good communication skills and ability to work in teams, are also prerequisites for engineers to succeed in the real life.

All engineers must possess basic IT skillsets and it is a given since digital technologies are transforming every aspect of our lives.

A multidisciplinary INAE Expert Group will critically examine the current status of engineering education, identify gap areas and strive to fill those gaps with appropriate action plans

4. World Class Infrastructure

INAE will come up with an action plan in consultation with all stake- holders to upgrade our national infrastructure within next few years. This will include

- Requirements, technology options and the investments needed to create a few smart cities in the country - including mobility, healthcare facilities, e-governance, access to affordable housing, utilities (electricity and water), waste collection, processing and recycle, education, communication, maintenance of infrastructural facilities, disaster management infrastructure including extreme events (for example, excessive rain and floods) etc.
- Requirements, technology options and the investments needed to create a rural infrastructure so that they can enjoy access to certain basic amenities where they are located - digital connectivity for example can provide them with access to healthcare, online education, information dissemination, financial inclusion, logistics warehousing and agriculture and farm productivity with engineering focus etc.

5. Cyber-physical Systems

Globally innovations are taking place at the interface of digital technologies and domain expertise. For example, manufacturing is being transformed as a consequence of the following - robotics and automation, Internet of Things (IoT), cloud computing, 3D printing, AI, machine learning and data analytics (Digital Twins), structural health monitoring of built structures and engineered products, drones, autonomy, data analytics based predictive asset maintenance systems, blockchain technology to facilitate complete traceability of the products, digital platforms for integrated design, development, deployment and monitoring of materials and products and knowledge engineering platforms for capturing, retaining and context sensitive retrieval of knowledge to solve challenging problems.

Similarly leveraging the advanced digital technologies, the infrastructure available in a given locality or a city can be upgraded for easy accessibility – for example, healthcare facilities, e-governance, utilities (electricity and water)

It is now possible to make most of healthcare facilities available to the citizens at their place ofresidence (particularly important for senior citizens living alone) through the intervention of digital connectivity, sensors and IoT solutions. Provision of healthcare and affordable Medicare facilities through technological interventions is a key focus area.

INAE will select certain areas for focussed attention during the next five years and develop strategies to create infrastructure to facilitate digital transformation for achieving a set of desirable objectives for example, higher productivity, higher efficiency, better quality of life and better quality of products, reduced cost of services, higher safety of workers, etc.

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ACADEMY ACTIVITIES

Academy News (Covering period from January 2026 to March 2026)

Joint activities with SERB (now ANRF) – INAE

I. ANRF (erstwhile SERB) – INAE Online and Digital Gaming Research Initiative

INAE is implementing the SERB–INAE Online and Digital Gaming Research Initiative with the objective of promoting digital gaming research and strengthening India's self-reliance in advanced Augmented Reality (AR) and Virtual Reality (VR) technologies. As digital gaming represents a relatively new area of research and development in the country, a pre-conclave and conclave were organized, following which a call for proposals was launched under three categories:

- Category I: R&D in Learning, Educational, and Leisure Online Gaming Platforms
- Category II: Immersive Game Prototypes, with a focus on Indian Culture & Values
- Category III: Collaborative Technical Design Process- Creation of SERB Game Labs

An initial allocation of ₹25 crore (recurring and non-recurring) was received from SERB. Subsequently, in May 2024, the G-Hub project under Category III was withdrawn by ANRF and currently, 11 projects under Categories I and II are in progress.

Project monitoring and review are carried out by the Program Management and Advisory Committee (PMAC), constituted to evaluate, select, and oversee the funded projects. PMAC review meetings are conducted on a biannual basis, during which Principal Investigators, Co-Principal Investigators, and industry partners present progress updates and demonstrate the games developed. To date, four review meetings have been conducted-two online in March 2024 and April 2025 and two in-person in November 2024 and 2025. Based on PMAC recommendations, second-year funding has been disbursed for the projects. The PMAC has also recommended no cost extension of projects till September 30, 2026 towards completion of the project deliverables.

Joint Initiatives with DST

I. India–Taiwan Programme of Cooperation in Science & Technology (DST–INAE)

The International Cooperation Division (ICD) of the Department of Science and Technology (DST) entrusted INAE with the implementation of the India–Taiwan Programme of Cooperation in Science & Technology from 2023 onwards. The programme is jointly coordinated with National Science and Technology Council (NSTC) and supports collaborative research through annual joint calls for proposals. Under the Call for Proposals (CFP) 2022, 11 projects were inherited from Global Innovation and Technology Alliance (GITA), which are currently under progress.

For the 2023 call, proposals were invited in five broad thematic areas: (i) Artificial Intelligence, IoT (Internet of Things), Big Data, Cyber Security, (ii) Green Energy Technology/ Renewable Energy (solar energy and bioenergy)/ Clean Energy, (iii) Micro/Nano-electronics, Embedded Systems & Sensors, (iv) Biotechnology, Healthcare including Functional Genomics, Drug Development and Biomedical Devices, Agriculture and Food Sciences and (v) Aerospace Technology. Proposals were evaluated by a Project Evaluation Committee (PEC) constituted by DST, based on which 15 projects were approved and are currently being progressed. In the 2024 call, "Manufacturing Processes" was introduced as a new thematic area, while the earlier domain of Micro/Nano-electronics, Embedded Systems and Sensors was replaced with "Semiconductors and Communications." Following PEC evaluation, 15 projects were recommended and approved by DST.

The call for proposals for the year 2025 was open from 2 June to 31 July 2025 and covered five priority domains: (i) Artificial Intelligence, Cyber Security, Quantum technology (ii) Biotechnology, Healthcare including Functional Genomics, Drug Development and Biomedical Devices, Agriculture and Food Sciences, (iii) Green Energy Technology/ Renewable Energy (solar energy and bioenergy)/ Clean Energy, (iv) Semiconductor & Communication, and (v) Green Manufacturing Technologies. A total of 185 eligible proposals were received. The projects are currently under evaluation and the results will be jointly announced by INAE and NSTC post evaluation and approval by DST.

A Joint Committee Meeting between DST and NSTC was held on 17 November 2025 in Taipei, during which both sides deliberated on the future activities of the programme.

II. Vaishvik Bharatiya Vaigyanik (VAIBHAV) Scheme – ICD, DST

The Vaishvik Bharatiya Vaigyanik (VAIBHAV) Fellowship Scheme, instituted by DST and implemented by INAE, aims to foster collaboration between Indian diaspora scientists and Indian higher education institutions, universities, and publicly funded research organizations. Under the call for proposal (CFP) 2023, 22 VAIBHAV Fellows and 2 Distinguished VAIBHAV Fellows were selected. The projects were sanctioned, first – year and second- year funds have been disbursed to eligible fellows, and visits to Indian host institutions by the VAIBHAV Fellows are being progressed. Post-visit reports from fellows who have completed their visits are being received and submitted to DST.

Under the CFP 2024, 17 VAIBHAV Fellows were selected by DST. First-year funding has been disbursed to 16 eligible fellows. The visits to Indian host institutions by the VAIBHAV Fellows are being progressed and their post-visit reports are being received and submitted to DST.

Under CFP 2025, 21 VFs and 1 DVF was selected by DST. Documentations are being collected from the respective fellows to initiate further administrative processes.

Events/Programs conducted by INAE from January to March 2026

The Centre for Engineering Education Excellence (CEEE) Program

Summary: The Centre for Engineering Education Excellence (CEEE) Program, launched through CSR funding from the Infosys Foundation in partnership with the Indian National Academy of Engineering (INAE), is a transformative initiative aimed at elevating the quality of engineering education in India. Recognizing the pressing need to bridge the skills gap among engineering graduates, particularly from Tier 3 and 4 institutions, the ₹38.35 crore, four-year program (2024–2028) focuses on upskilling faculty members who teach core engineering subjects during formative undergraduate semesters. By leveraging the mentorship of INAE Fellows, domain experts, and senior faculty from premier institutions, the program delivers a blended model of physical and virtual training across five key engineering domains. With a goal to mentor nearly 3,750 faculty members through 125 mentors by its conclusion, CEEE seeks to indirectly impact thousands of engineering students, enhancing their employability and innovation capacity. A robust governance structure ensures accountability and quality, while competitive financial support enables widespread participation. This initiative exemplifies a powerful collaboration between industry and academia, advancing national goals such as Skill India and contributing meaningfully to the vision of a Viksit Bharat by 2047.

The formal press release was released on 19th December 2024 and link for the same is:

https://www.infosys.com/newsroom/press-releases/2024/collaborate-transform-engineering-education-india.html

The MoU was signed with Infosys Foundation, AICTE and IITs Kharagpur, Madras, Bombay, Kanpur and Delhi.

The program focuses on faculty engaged in teaching core, fundamental courses during the second, third, and fourth semesters - a critical stage where students acquire essential engineering concepts. The five domains covered under the initiative include:

- Computer Science and Information Technology (including Data Science and AI/ML)
- Electrical, Electronics, and Instrumentation Engineering
- Mechanical, Aerospace, and Energy Engineering
- Materials, Chemical, and Biomedical Engineering
- Civil and Environmental Engineering

For each domain, five strategically selected core subjects were identified. The faculty selected for this program (mentees) underwent a combination of intensive physical mentorship and virtual training annually. The physical mentorship for two-week program was conducted during the summer months (from 26th May-18th July 2025) wherein a total of 871 Mentees had undergone the physical mentoring by the renowned IIT faculty. This was followed by a two to three-week virtual mentorship program till 31st December 2025.

INAE also conducted a series of online lectures by eminent corporate and industry experts under the CEEE program. These distinguished experts spoke about: The emerging strengths and opportunities in their respective domains; Current industry expectations from engineering graduates and Skills, competencies, and professional attributes required for future-ready careers. The details of the lectures are as follows: The first speaker Dr. Janhavi Raut, FNAE Director, R&D, Unilever R&D Centre, Bangalore shared valuable insights on research, innovation, and industry practices on the topic "SOAP: A continuing sustainability journey" on February 28, 2026. Mr Rajendra Petkar, President and Chief technology Officer, Tata Motors delivered the second lecture on "The Global Mobility Transition: Opportunities in domains of electrical, electronics and Instrumentation Engineering" on March 10, 2026. The third online lecture was by Dr Tapan Sahoo, *FNAE*, Executive Director (Digital Enterprise), Maruti Suzuki India Ltd who delivered an enthralling lecture on March 21, 2026 on the topic Role of digital transformation & application of new technologies like AI in mobility sector". The fourth online Expert Talk of this Lecture Series was by Dr. Manish Gupta, FNAE, Senior Director Google DeepMind on 28th March 2026 on the topic "The Transformative Power of AI and Open Challenges.

Building on the experience of the 2025 cycle, the CEEE Programme will transition to a fully automated implementation model from 2026 onwards. This transition is expected to improve efficiency, scalability, and participant outreach, enabling the programme to achieve its annual target of 1,250 mentees. Overall, the CEEE Programme aims to mentor approximately 3,750 faculty members through 125 mentors by 2028, contributing meaningfully to national initiatives such as Skill India and the vision of Viksit Bharat @2047.

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Local Chapter Activities and Webinar Series held during January to March 2026

The following Webinars/activities/meetings/Technical Lectures were conducted during January to March 2026 by INAE Local Chapters.

INAE Bhubaneswar Chapter

(i) The 73rd lecture of the INAE Distinguished Lecture Series was organized by INAE Bhubaneswar Chapter, jointly with SOA University, CSIR-IMMT Bhubaneswar, IIT Bhubaneswar, NISER Bhubaneswar and IEEE Bhubaneswar Sub-section and delivered by Prof. Kirti Chandra Sahu, IIT Hyderabad on 5th February2026 on "Unravelling Rainfall Estimation through the Journey of a Raindrop*"*.

Key Points: Raindrops, on their descent from clouds to Earth, display a variety of shapes and sizes owing to intricate interactions among droplets and the atmosphere. Microphysical processes such as fragmentation, coalescence, and phase change, strongly influenced by atmospheric temperature and humidity gradients, play a major role in driving this variability. The distribution of raindrop shapes and sizes plays a pivotal role in accurately estimating rainfall using weather radar, a crucial yet unknown aspect that currently relies on scientists making assumptions to measure precipitation. In this presentation, droplet interaction dynamics with straight and swirl airstreams was explored. In a swirl flow, the droplet experiences oppose-flow, cross-flow, and co-flow conditions, resulting in distinct droplet morphologies compared to a straight airstream. The observations revealed a novel breakup phenomenon, termed the "retracting bag," in swirl flow. A theoretical analysis was proposed based on the Rayleigh–Taylor instability to elucidate the droplet breakup phenomenon in swirl flows. Additionally, some of the recent findings were discussed obtained using the inline holography technique, which provide size distributions of satellite droplets resulting from the fragmentation of larger droplets, shedding light on this intricate aspect of rainfall dynamics. The talk also covered the unique Raindrop Research Facility, established at IIT Hyderabad, which is the first of its kind to replicate dynamic atmospheric conditions from the cloud to the ground.

Bio-data: Prof. Kirti Sahu is a professor in the Department of Chemical Engineering at IIT Hyderabad and served as the Head of the Department from 2014 to 2017. His research interests include the study of clouds and raindrops, interfacial flows, and hydrodynamic instabilities. Prof. Sahu has received several prestigious recognitions, including the Young Scientist Award from the Indian National Science Academy (INSA, New Delhi) and the National Academy of Sciences India (NASI, Prayagraj), the Young Associate of the Indian Academy of Sciences (IAS, Bangaluru) and the VASVIK Award. He is a fellow of the Indian National Academy of Engineering (FNAE), the Indian Academy of Sciences (FASc), and the Institute of Physics, UK (FInstP). He serves as an associate editor for Industrial & Engineering Chemistry Research and is a member of the editorial board for Langmuir. Prof. Sahu also serves on the External Affairs Committee of the Division of Fluid Dynamics of the American Physical Society (2024-2026).

You Tube Video Recording Link: https://youtu.be/gJso5Ahk68s
No. of Participants: 30

(ii) The 74th lecture of the INAE Distinguished Lecture Series was organized by INAE Bhubaneswar Chapter, jointly with SOA University, CSIR-IMMT Bhubaneswar, IIT Bhubaneswar, NISER Bhubaneswar and IEEE Bhubaneswar Sub-section and delivered by Prof. Soumen Chakrabarti, IIT Bombay on 10th February 2026 on "Dense Retrieval for Tables, Databases, and Quantities".

Key Points: Starting from sparse inverted indices and vector space models, information retrieval has made major strides in the era of deep learning, by evolving to use dense word and passage representations and approximate nearest neighbour search. However, dense retrieval is needed

beyond linear passages, and for rich data types. In this talk, retrieval from tables and enhanced representation for quantities and comparisons was focused upon, strongly motivated by financial or engineering reports as well as e-commerce. In the first part, TabSegNet, a retrieval system to support complex text+table question answering was described. TabSegNet represents tables as a fine-grained, richly-featured graph. The query is segmented by an LLM, and the segments influence parameters of a graph neural network that retrieves nodes from the table-derived graph. Extending the paradigm from textual table retrieval to text2sql, it was shown that a hallucinated schema can be effective for retrieving real schema fragments needed to generate SQL. In the second part, the talk covered DeepQuant, a dense retrieval system with enhanced representation for quantities (numerals and units) and comparison intent in queries (42 in shirt under 500). The experiments suggest that monolithic language models can benefit from asserting such specific inductive biases to better represent tabular layout and quantities.

Bio-data : Prof Soumen Chakrabarti received his B.Tech in Computer Science from the Indian Institute of Technology, Kharagpur, in 1991 and his M.S. and Ph.D. in Computer Science from the University of California, Berkeley in 1992 and 1996. At Berkeley he worked on compilers and runtime systems for running scalable parallel scientific software on message passing multiprocessors. He was a Research Staff Member at IBM Almaden Research Center from 1996 to 1999, where he worked on the Clever Web search project and led the Focused Crawling project. In 1999 he joined the Department of Computer Science and Engineering at the Indian Institute of Technology, Bombay. In Spring 2004 he was Visiting Associate professor at Carnegie-Mellon University. During 2014-2016 he was Visiting Scientist at Google, Mountain View. He has published in the WWW, SIGIR, ACL, EMNLP, NeurIPS, ICLR, ICML, SIGKDD, SIGMOD, VLDB, ICDE, SODA, STOC, SPAA and other conferences as well as Scientific American, IEEE Computer, VLDB and other journals. He won the best paper award at WWW 1999. He was a coauthor on the best student paper at ECML 2008. His work on keyword search in databases got the 10-year influential paper award at ICDE 2012. He has two spotlight papers at NeurIPS. He won the Jagadis Bose National Fellowship in 2019, the Shanti Swarup Bhatnagar prize in 2014, and is a fellow of the Indian National Academies of Engineering and Science. He holds thirteen US patents on Web-related inventions. He is also the author of one of the earliest books on Web search and mining. He has served as technical advisor to search companies and vice-chair or program committee member for WWW, SIGIR, SIGKDD, NeurIPS, ICML, ICLR, TACL, ARR, VLDB, ICDE, SODA and other conferences, and guest editor or editorial board member for DMKD and TKDE journals. He has served as inaugural program chair for WSDM 2008 and program chair for WWW 2010.His current research interests include integrating, searching, and mining text and graph data models, exploiting types and relations in search, and knowledge graph representation.

No. of Participants: 30

(iii) The 75th lecture of the INAE Distinguished Lecture Series was organized by INAE Bhubaneswar Chapter, jointly with SOA University, CSIR-IMMT Bhubaneswar, IIT Bhubaneswar, NISER Bhubaneswar and IEEE Bhubaneswar Sub-section and delivered by Prof. Sunita Sarawagi, IIT Bombay on 26th February 2026 on "Beyond Prompting: Structure-Aware Adaptation for Reliable LLMs".

Key Points: Many applications require few-shot adaptation for structured prediction tasks from semantic parsing for custom APIs and Text-to-SQL over private databases to learning to call new tools. In-Context Learning (ICL) is the dominant approach for adapting large language models (LLMs) to new tasks, yet its limits emerge when tasks require compositional generalization, schema fidelity, or strict guarantees. Through a mechanistic analysis with synthetic formal languages, it was shown why even highly capable models can struggle to infer input–output correspondences from demonstrations alone.

A spectrum of lightweight adaptation strategies was presented, including parameter-efficient updates that blur the boundary between prompting and fine-tuning, structured decomposition to externalize alignments, and grammar-aware decoding for correctness. Together, these approaches signal a shift from prompt-only adaptation toward structure-aware control of input encoding and guided generation.

Bio-data: Prof. Sunita Sarawagi researches in the fields of databases, machine learning, and applied NLP. She is Institute Chair Professor in the Computer Science Department and was the founding head of the Center for AI at IIT Bombay. She got her PhD in databases from the University of California at Berkeley and a bachelor's degree from IIT Kharagpur. She has also worked at Google Research, CMU, and IBM Almaden Research Center. She is an ACM fellow, was awarded the Infosys Prize in 2019 for Engineering and Computer Science, and the distinguished Alumnus award from IIT Kharagpur. She has several publications including notable paper awards at ACM SIGMOD, ICDM, and NeuRIPS conferences.

No. of Participants: 35
You tube Link: https://youtu.be/Q8DzGDMDa_E

(iv) The 76th lecture of the INAE Distinguished Lecture Series was organized by INAE Bhubaneswar Chapter, jointly with SOA University, CSIR-IMMT Bhubaneswar, IIT Bhubaneswar, NISER Bhubaneswar and IEEE Bhubaneswar Sub-section and delivered by Dr. C. P. Gurnani, former Tech Mahindra on 16th March 2026 on "Service Economy to Innovation Economy: India's AI Moment".

Key Points: The lecture focused on various aspects of innovation and centres around the transformation of IT Services of which India is a global leader to the world's most powerful innovation power house. The speaker shared his experience in doing this.

Bio-Data: Dr. C. P. Gurnani is a Chemical Engineering Graduate and Distinguished Alumnus of NIT Rourkela. He is Co-Founder and Vice-Chairman, AIonOS. He is Former CEO & MD, Tech Mahindra and Former Chairman, NASSCOM. He is an elected Fellow of Indian National Academy of Engineering.

No. of Participants: 510
You tube Link: https://youtu.be/XSx6zO8HwMA

INAE Kharagpur Chapter

Meeting of INAE Kharagpur Local Chapter held on January 22, 2026 at Committee Room, IIT Kharagpur

A meeting of the INAE Kharagpur Local Chapter was held on January 22, 2026 which was attended by Prof. Indranil Manna, Former President of INAE; Mr. J. D. Patil, President of INAE; and Dr. S. Somanath, Vice President of INAE, Lt. Col. Shobhit Rai, Deputy Executive Director, Indian National Academy of Engineering (INAE) along with about nine other INAE dignitaries who were visiting IIT Kharagpur at that time for attending the International Conference on "Frontiers of Surface Engineering and Additive Manufacturing (FSEAM)" organized at IIT Kharagpur. From the INAE Kharagpur Chapter, Prof. Suman Chakraborty, Director of IIT Kharagpur, and around fifteen INAE Fellows and Young Engineers Awardees were present. Several senior INAE Fellows from IIT Kharagpur, including Prof. Prasanta Kumar Das, Prof. Mrityunjay Chakraborty, Prof. Sunando Dasgupta, Prof. Rahul Mitra and Prof. Mira Mitra, actively participated in the meeting. The meeting was also attended by the Executive Committee members of the INAE Kharagpur Chapter, namely Prof. Dipanwita Roy

Chowdhury (Chairperson), Prof. Samit Kumar Ray (Co-Chair), Prof. D. K. Pratihar (Honorary Secretary/Convener), and Prof. Sumantra Mandal (Treasurer).

The meeting commenced with a brief introduction, followed by a series of addresses and presentations by distinguished members of INAE and the IIT Kharagpur. The discussions focused on the current initiatives, future directions, and strategic priorities of INAE, along with the contributions and planned activities of the INAE Kharagpur Chapter. The key deliberations and proceedings of the meeting are summarized below:

1. Welcome and Introduction

Prof. Indranil Manna, former President of INAE

Prof. Indranil Manna, former President of the Indian National Academy of Engineering (INAE), addressed the members during the INAE Kharagpur Chapter meeting. He extended a warm welcome to President INAE, Vice President, and other dignitaries who were visiting IIT Kharagpur during the week and had joined the meeting. In his address, Prof. Manna provided a brief background on the constitution and establishment of the INAE Kharagpur Chapter. He highlighted the key activities conducted under the Chapter so far, with particular emphasis on the INAE Youth Conclave, which he noted as a highly successful and impactful event. Prof. Manna concluded his remarks by encouraging the current executive committee of the INAE Kharagpur Chapter to organize more academic and professional activities throughout the year, with the aim of further strengthening the Chapter's engagement and contributions.

2. Insights into the Priorities and Focus Areas of INAE

Mr. J. D. Patil, President, INAE, addressed the members and shared key insights into the priorities and focus areas of the Academy, highlighting its role in promoting engineering excellence, policy engagement, and capacity building. He drew attention to the pressing issue of financial sustainability following the discontinuation of funding support from the Department of Science and Technology (DST) effective from 1 April 2025. In this context, he provided a brief historical background of the disengagement and outlined the efforts made by INAE to engage with the Prime Minister's Office (PMO), the Principal Scientific Adviser (PSA), various government and strategic departments, and professional bodies to reconsider the decision. He emphasized the need for continued and coordinated efforts to strengthen engagement with government agencies and to enhance awareness of INAE's activities.

Mr. Patil further highlighted the requirement of generating a high amount fund annually to sustain INAE's operations and stressed the importance of establishing a Corpus Fund to ensure long-term financial stability and functional autonomy. He also presented various strategies and potential sources for fund generation, including corporate donations, institutional memberships, individual contributions, corporate social responsibility funding, government grants, and publication royalties. The members noted the concerns and appreciated the strategic directions outlined for strengthening the sustainability and outreach of INAE.

3. Address by the Director, IIT Kharagpur

Prof. Suman Chakraborty, Director, IIT Kharagpur, graciously addressed the gathering and extended a warm welcome to all INAE dignitaries, Fellows, and awardees present. He highlighted the legacy of IIT Kharagpur as the oldest Indian Institute of Technology and emphasized its wide spectrum of engineering disciplines, along with the high-quality research contributions made by its faculty members and research scholars. He also noted the long-standing association between IIT Kharagpur and INAE, acknowledging the institute's contributions to the Academy's activities. Prof. Chakraborty expressed his expectation that IIT Kharagpur would continue to actively participate in and contribute to future initiatives of INAE.

4. IIT Kharagpur's Contribution to the CEEE Program of INAE

Prof. Prasanta Kumar Das, Centre Coordinator of INAE CEEE 2025, presented a brief overview of the implementation of the program at IIT Kharagpur. He outlined the key steps involved, including initiation by INAE, institute-level discussions and approval, signing of the MoU, formation of a multidisciplinary team across five engineering domains, and release of funds. The program was conducted in offline mode during June–July 2025, with well-planned academic and logistical arrangements such as faculty allocation, laboratory demonstrations, provision of lecture materials, accommodation, transportation, and special support for female participants. The program witnessed participation from over 200 faculty members from diverse institutions across India, with strong engagement particularly in laboratory demonstrations. The feedback received was highly positive regarding both academic content and overall organization, and there were requests for advanced-level courses. Follow-up online sessions were also conducted, and reports were submitted to INAE. Based on the success and experience of the 2025 program, preparations are underway for future INAE CEEE Program at IIT Kharagpur, with plans to expand participation and introduce advanced modules.

5. Discussion on Newly Proposed INAE Membership Nominations

Lt. Col. Shobhit Rai, Deputy Executive Director, Indian National Academy of Engineering (INAE), briefed the members on the newly proposed INAE Membership. He elaborated on the framework and objectives of expanding the membership base to strengthen the Academy's outreach and engagement. He further clarified the distinction between the existing INAE Fellowship and the newly introduced categories of membership, namely Corporate Membership, Institutional Membership, and Individual Membership, highlighting their respective roles and benefits. Lt. Col. Rai also conveyed his appreciation and extended congratulations to IIT Kharagpur for joining INAE as an Institutional Member. All appreciated the initiatives taken by INAE to broaden its membership structure and enhance institutional participation.

6. Suggestions and New Initiatives

Prof. Sunando Dasgupta, Reputed INAE Fellow of Kharagpur Chapter proposed a yearly Research Meet / Research Workshop to be organised under the banner of INAE Kharagpur Chapter which will provide a dedicated platform for young researchers, PhD scholars, postdoctoral fellows, and early-career faculty members to present their work, exchange ideas, and interact with senior INAE Fellows and experts.

7. Ongoing and Projected Activities of the INAE Kharagpur Chapter

Prof. Dipanwita Roy Chowdhury, Chairman of INAE Kharagpur Chapter briefly outlined two key initiatives proposed by the INAE Kharagpur Chapter as part of the future activities, aimed at strengthening academic engagement and nurturing young talent.

First, to initiate a Lecture Series by Eminent Researchers. This series will feature distinguished INAE Fellows and leading researchers from academia, industry, and national laboratories. The lectures will be organized in both online and offline modes, enabling wider participation while also encouraging in-person academic interaction on campus. The objective is to expose students, researchers, and faculty to cutting-edge research, emerging technologies, and real-world engineering challenges.

Second, to conceptualize and organize a "Young Researchers Conclave" under the aegis of the INAE Kharagpur Chapter. The conclave may include invited talks, technical presentations, mentoring sessions, and panel discussions focused on research directions, innovation, and career development. Through these initiatives, the INAE Kharagpur Chapter aims to actively contribute to INAE's mission of promoting excellence in engineering and technology, while fostering a vibrant and inclusive research ecosystem at IIT Kharagpur

8. Closing Remarks and Thanks

Prof. Samit Kumar Ray, Co-chair of INAE Kharagpur Chapter, expressed his sincere thanks to all the attendees. The meeting concluded with the closing remark: "The INAE Kharagpur Chapter aims to actively contribute to INAE's mission of promoting excellence in engineering and technology, while fostering a vibrant and inclusive research ecosystem at IIT Kharagpur."

Photographs of the Meeting

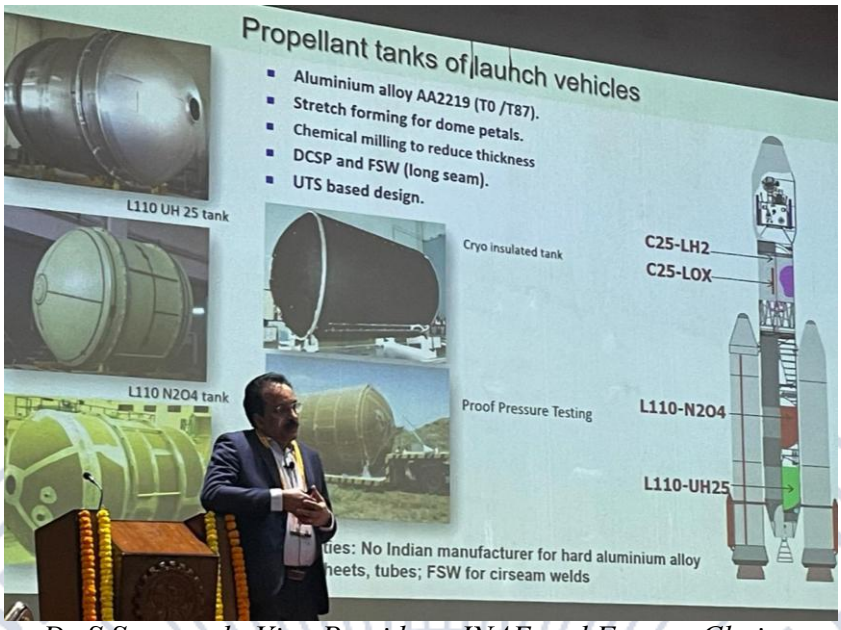
INAE Kharagpur Chapter Meeting in Progress in presence of Prof. Suman Chakraborty, Director, IIT Kharagpur with Mr JD Patil, President, INAE, Prof. Indranil Manna, Immediate Former President, INAE, Dr. S Somanath, Vice-President, INAE, Prof. BS Murty, Director, IIT Hyderabad and other esteemed Fellows of INAE

(Left to Right): Prof Indranil Manna, Dr S Somanath, Mr J.D. Patil, Prof B.S. Murty and Lt Col Shobhit Rai (Retd)

Dr S Somanth, Vice President, INAE (left) being felicitated by Prof Suman Chakraborty, FNAE Director, IIT Kharagpur

Mr J.D. Patil, President, INAE (left) being felicitated by Prof Suman Chakraborty, FNAE, Director, IIT Kharagpur

Prof Indranil Manna, Immediate former President, INAE delivering a Talk



Dr S Somanath, Vice-President, INAE and Former Chairman, ISRO delivering lecture

Visit of dignitaries to Lab at IIT Kharagpur

INAE Mumbai Chapter

I. INAE Mumbai Chapter organized a Webinar on "The legislative framework for nuclear energy in India", by Dr. Ravi Bhushan Grover**,** Member, Atomic Energy Commission, Chairman, Board of Research in Nuclear Sciences, and Distinguished Professor Emeritus, Homi Bhabha National Institute (HBNI) at Niyamak Bhavan, Atomic Energy Regulatory Board (AERB) Mumbai on 20th January 2026 from 1500-17:00 hours in hybrid mode.

The program started with welcoming the speaker and distinguished audience by Dr. Gopika Vinod, Secretary, INAE Mumbai Chapter. Sh A.K. Balasubrahmanian, Chair INAE Mumbai Chapter & Chairman AERB gave opening remarks, highlighting the importance of the topic considering the changing times and passing of SHANTI ACT and introduced the speaker.

Talk highlighted The SHANTI Act (Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India Act, 2025) which is India's landmark legislation overhauling its nuclear framework. The Act consolidates regulation, enforcement, civil liability, and dispute resolution within a single

statute. It enables private sector participation in building and operating nuclear power plants, but core functions remain with the Central Government. It separates permission to establish a facility from that to operate it safely, requiring both a license and safety authorisation. Sufficient guardrails have been embedded in the Act to ensure that India continues to manage nuclear science and technology responsibly. The speaker gave a lucid presentation of all legacy events in Nuclear Energy Regime of India and connected the relevance of the landmark legislation to the present era.

The talk was attended by a large number of officers from DAE fraternity, as well as many online participants from diverse background. INAE Fellows Dr. A.K. Anand, Mr. S.M. Ingole attended in person and several INAE Fellows joined online. There was significant online participation of around 118 persons. The talk was followed by interactive session with audience and responding to all the queries raised in the chatroom. The interactive session was moderated by Mr. S. Hari Kumar, Director (RA&ER), AERB. Meeting concluded with vote of thanks proposed by Dr. Gopika Vinod, Secretary, INAE Mumbai Chapter.

Photographs from the event are given below:

Mr. A.K. Balasubrahmanian, Chair INAE Mumbai Chapter delivering Opening Remarks

Felicitation of Dr. Ravi Bhushan Grover by Mr. A.K. Balasubrahmanian

Glimpses of the Audience

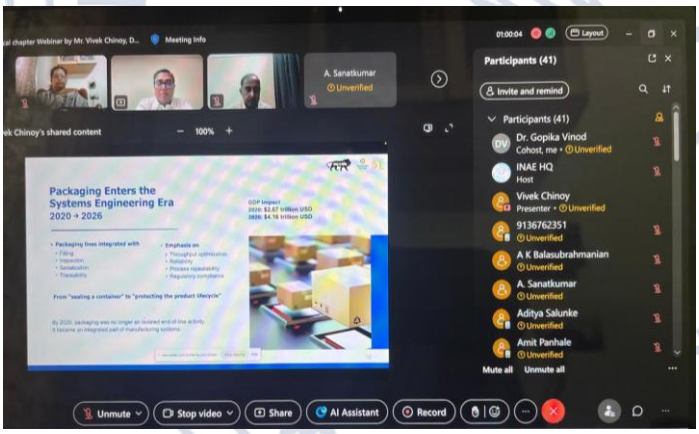
II. INAE Mumbai Chapter organized a Webinar on "From Containment to Intelligence, The Engineering Evolution in Solutions to Industrial Packaging Systems", by Mr. Vivek Chinoy, Director, Electronics Devices Worldwide Pvt. Ltd., Vice President, IPMMI, Executive Committee Member, IPMMA on 14th February 2026 from 1600-18:00 hours in online mode.

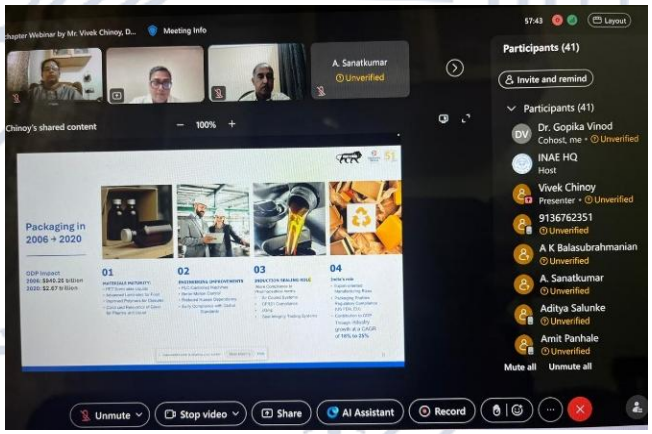
The program started with welcoming the speaker and distinguished audience by Dr. Gopika Vinod, Secretary, INAE Mumbai Chapter. Sh A. K. Balasubrahmanian, Chair INAE Mumbai Chapter & Chairman AERB gave opening remarks, highlighting the importance of the topic and subsequently, Secretary, INAE Mumbai Chapter introduced the speaker. The lecture traced the engineering evolution of packaging through mechanization, automation, regulatory compliance, and energy-efficient machine design, highlighting its critical role in food, pharmaceutical, and several other industrial applications.

Packaging systems have evolved from primitive forms of containment using paper, metal, glass, and early polymers into complex, engineered systems that enable safety, scalability, and reliability across global supply chains. As manufacturing systems move toward smart, connected, and data-driven architectures, packaging is transforming into an intelligent system, integrating materials science, sensors, process control, and digital traceability. This talk also examined India's journey in packaging engineering, its growing global contributions, and the opportunities ahead for positioning India as a significant contributor to sustainable and intelligent packaging systems of the future.

The talk was attended by many online participants from diverse background including many INAE Fellows - Mr. Sanatkumar, Dr. R. Yadav, Mr. Arun Kumar Paul and others. There was significant online participation of around 40 persons. The talk was followed by interactive session with audience and responding to all the queries raised in the chatroom. The Meeting concluded with Chairman, thanking the speaker and all online participants for joining and making a lively online session.

Photographs during the session are given below:



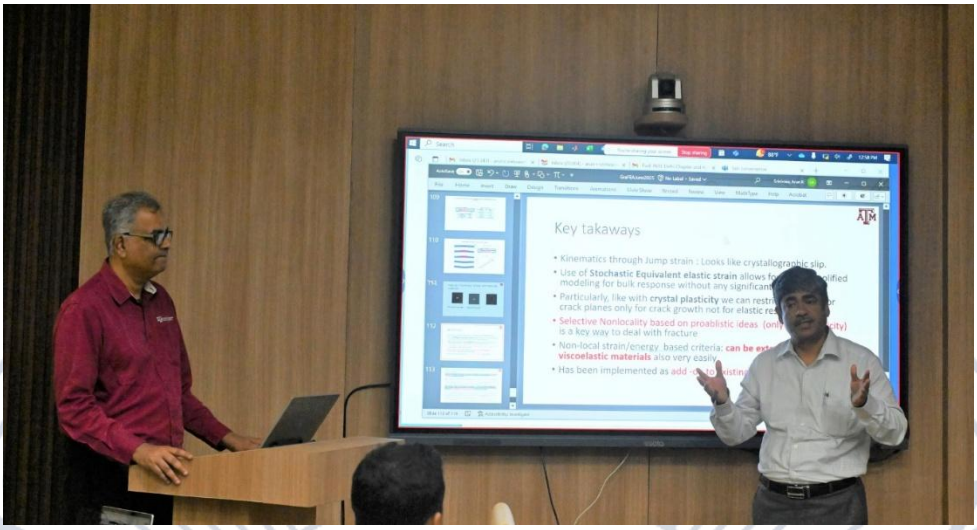


INAE Delhi Chapter

1. INAE Seminar on Graph-Based Nonlocal Mechanics Successfully Held at IIT Delhi (*pertaining to previous quarter)*

The Delhi Chapter of the Indian National Academy of Engineering (INAE), in collaboration with the Applied Mechanics Department (AMD), IIT Delhi, successfully hosted an insightful seminar on "Breaking up is hard to do: Simulating fracture of quasi-brittle materials, viscoelastic solids and delamination of composites using GraFEA" on Friday, June 20, 2025. The distinguished speaker, Prof. Dr. Arun R. Srinivasa, Associate Dean at Texas A&M University (TAMU), delivered a thought-provoking lecture introducing a novel Graph-Based Finite Element Analysis (GraFEA) framework. The seminar showcased cutting-edge methods to simulate damage and fracture propagation in advanced materials, offering significant improvements in computational efficiency and physical realism. Prof.

Srinivasa also shared perspectives on integrating mechanics, graph theory, and computational modeling - demonstrating how such techniques can extend commercial tools like ABAQUS to solve real-world engineering challenges. Heartfelt thanks are expressed to Prof. Sushma Santapuri and Prof. Saikat Sarkar for coordinating this impactful seminar.



Prof. Dr. Arun R. Srinivasa (Left) and Prof Santosh Kapuria, IIT Delhi (Right)

National Seminar on "**National Education Policy (NEP) 2020: Envisioning Implementation in Engineering and Technology Curricula**"

The Department of Civil and Environmental Engineering, IIT Delhi in association with the INAE Delhi Chapter successfully organized a National Seminar on "National Education Policy (NEP) 2020): Envisioning Implementation in Engineering and Technology Curricula" on 1st January 2026, in hybrid mode. The seminar was delivered by Professor Dr Anil Sahasrabudhe, *FNAE,* Chairman of the Executive Committee of the National Assessment and Accreditation Council (NAAC) and Chairman of both the National Educational Technology Forum (NETF) and the National Board of Accreditation (NBA). In his comprehensive and insightful address, Professor Sahasrabudhe elaborated on the transformative vision of NEP 2020 and its far-reaching implications for engineering and technology education in India.

The lecture highlighted the shift envisaged by NEP 2020 from rigid, discipline-centric curricula to holistic, multidisciplinary and flexible learning frameworks. Emphasis was laid on integrating humanities, social sciences, management, ethics, and emerging technologies with core engineering education to develop technically competent, socially responsible, innovative, and empathetic graduates. The speaker also discussed key policy features such as multi entry and exit options, experiential and project-based learning, industry engagement, and the incorporation of contemporary areas including artificial intelligence (AI), machine learning (ML), data science, renewable energy, robotics and

cybersecurity. Faculty development, continuous upskilling, and technology-enabled learning were underscored as critical enablers for successful implementation.

The program commenced with welcome remarks and an introduction of the speaker by Professor Dr Vivek Vitthal Buwa, Deputy Director (Strategy & Planning), IIT Delhi. Professor Dr Vasant Matsagar, *FNAE,* Honorary Secretary, INAE Delhi Chapter, and Head of the Department of Civil and Environmental Engineering, IIT Delhi, moderated the engaging session, which facilitated meaningful interaction and reflection among participants. The seminar witnessed active participation from large number of faculty members, researchers, students, and professionals from academia and industry, both in-person and online. It served as an important platform for dialogue on aligning engineering and technology education with national priorities and global best practices, and reinforced the collective commitment of academic institutions and professional bodies towards realizing the vision of NEP 2020.

Pictorial Delight of the Seminar:

Prof. Anil D Sahasrabudhe, FNAE delivering lecture

Participants during the Seminar

Professor Dr Vasant Matsagar, FNAE felicitating Professor Dr Vivek Vitthal Buwa

II. The Department of Civil and Environmental Engineering at IIT Delhi, in collaboration with the Delhi Chapter of the Indian National Academy of Engineering (INAE), successfully hosted a Seminar on "Investigations and Innovations in Seismic Performance of Non-Structural Elements (SPONSE): A Journey Towards Low-Damage/Low-Loss Buildings" on January 30, 2026, at 4:30 p.m. IST.

The seminar featured Professor Rajesh Dhakal, Head of the Civil and Environmental Engineering Department at the University of Canterbury, New Zealand, as the distinguished speaker. Professor Dhakal, a renowned expert in earthquake engineering and seismic performance of non-structural elements, shared insights into the vulnerabilities of current building designs and innovative low-damage solutions aimed at minimizing financial losses from earthquakes. His presentation highlighted research from New Zealand, including experimental validations through static and dynamic tests, underscoring the need for enhanced seismic resilience in secondary building components.

The event, inaugurated by Professor Vasant Matsagar, FNAE, drew active participation from faculty, researchers, and students, fostering valuable discussions on advancing low-loss building practices. Professor Srinivas Mogili moderated the proceedings of the event. The Department extends its sincere gratitude to Professor Dhakal for his enlightening talk, to INAE for their support, and to all attendees for their engagement.

Glimpses of the event

Participants at the Event

Professor Rajesh Dhakal delivering lecture

Felicitation of Prof. Rajesh Dhakal

Prof. Vasant Matsagar addressing the gathering

Participants at the Event

IV. INAE Delhi Chapter of Indian National Academy of Engineering (INAE) and Department of Civil and Environmental Engineering at Indian Institute of Technology (IIT) Delhi jointly organized a one-day hybrid workshop on "Resilient and Sustainable Structures under Extreme Loads" on the occasion of UNESCO (United Nations Educational, Scientific, and Cultural Organization): "World Engineering Day" for Sustainable Development on 3rd March 2026 from 10:30 a.m. - 3:00 p.m. (IST). The venue for in-person attendees was Block IV, Committee Room (221), Department of Civil and Environmental Engineering, Indian Institute of Technology (IIT) Delhi.

The Coordinator and Moderator of the said Workshop was Prof. Allan L. Marbaniang, Department of Civil and Environmental Engineering, IIT Delhi. During the Workshop four talks were held. The first talk was by Prof TK Datta, *FNAE* on the topic "An Overview of Wind Effects on Structures"; the second talk was by Prof Venkatesh Kumar Kodur, *FNAE* on "Structural Fire Engineering"; the third by Prof Dipti Ranjan Sahoo, *FNAE* on "Earthquake-Resistant Design of Structures" and the fourth talk was by Prof Vasant Matsagar, *FNAE* on "Blast Response of Structures". The participation in the workshop was free and participation certificates were given.

INAE Hyderabad Chapter

One-day Seminar on "Multi-Sensor Detection and Adaptive Tracking for Directed Energy Systems" held on 26 March 2026

A seminar on "Multi-Sensor Detection and Adaptive Tracking for Directed Energy Systems" was successfully organized by Centre for High Energy Systems and Sciences (CHESS), DRDO in association with Sensor Research Society (SRS) and Indian National Academy of Engineering (INAE) on March 26, 2026, Thursday, at the RCI Exposition Hall, CHESS-RCI campus. The event commenced at 0900 hrs and witnessed the participation of near about 150 members from DRDO labs, academic institutes and startups.

The seminar was graced by the Chief Guest, Dr. R.V. Hara Prasad, Distinguished Scientist (DS) and Director General of NS&M, who highlighted the strategic importance of multi-sensor integration in enhancing the effectiveness of directed energy systems. The Guest of Honour, Shri Anindya Biswas, Distinguished Scientist & Director of RCI and Dr. Dasharath Ram, Distinguished Scientist & Ex-Director, DRDL also addressed the gathering, emphasizing the need for continuous innovation in adaptive beam tracking technologies and directed energy systems. Dr. Jagannath Nayak, Distinguished Scientist & Director of CHESS felicitated the honourable guests and concluded the inauguration

session with his warm speech. The event was hosted by Dr. S Veerabuthiran, Scientist 'G', CHESS. A keynote lecture on "Radar for Detection of Low Observable Targets" was delivered by Prof. Kumar Vijay Mishra, Senior Fellow at the United States DEVCOM, Army Research Laboratory who elaborated on advanced radar techniques and their critical role in detecting stealth and low-signature objects.

The seminar was structured into three technical sessions. Session I was chaired by Prof. Suresh Sundaram, Professor, Department of Aerospace Engineering, Indian Institute of Science (IISc), Bengaluru. Dr. A. Vengadarajan, Former Outstanding Scientist, LRDE, delivered a talk on "Overview of Radar Technologies," followed by Shri Elayaperumal S, Scientist 'F', LRDE, who discussed challenges in detecting space objects using Radar. Dr. Bulbul Mukherjee, Deputy Director, ISTRAC, ISRO, spoke on the importance and challenges of space situational awareness, while Dr. Manvendra Singh, Scientist 'G', IRDE, presented on high-resolution electro-optical payloads for space applications. Session II was chaired by Prof. Prem Kiran, Professor, School of Physics, University of Hyderabad. Shri Deviprasad, Scientist 'E', DSP, delivered a presentation on satellite mission analysis. This was followed by Shri Sanjay Mittal, Scientist, LEOS, ISRO, who spoke on satellite laser ranging, and Dr. S. Veerabuthiran, Scientist 'G', CHESS, who elaborated on pulse laser systems for space applications. Session III was chaired by Prof. D. Roy Mahapatra, Professor, Department of Aerospace Engineering, Indian Institute of Science, Bengaluru. Md. Tanveer Ahmed, CTO of M/s Digantara, Bengaluru, spoke on applications of lasers in space. Shri Nitish Singh, from M/s Astrogate, Bengaluru, discussed laser communication technologies, while Shri Ravi Shankar, Scientist 'E', CHESS, presented on sensor-to-intelligence systems using machine learning for directed energy laser weapons.

The seminar concluded with a panel discussion led by Prof. Radhakant Padhi, Professor, Department of Aerospace Engineering, Indian Institute of Science, Bangalore joined by the session chairpersons and industry expert Mr Md. Tanveer Ahmed. The discussion emphasized interdisciplinary collaboration and future research directions in multi-sensor detection and directed energy systems. Prof. Padhi also recalled the importance of Department-Industry-Academia collaboration and quoted, "DRDO brings us some fantastic problems of applied sciences to work on and enlarge the learning of basic sciences and extend the theories". During the concluding address, Director, CHESS remarked, "In the upcoming decades, the directed energy systems will play a crucial role in the field of military and defense. Our capabilities should not be restricted by few kilometers rather it should be the sky, the space!". He also added, "To portray India's global recognition in space security, we have to promote intense and impactful research works. DRDO and other research members of the department along with the leading academic institutes and industries of India should work side by side to achieve the goal." The event ended with a vote of thanks, acknowledging the contributions of all dignitaries, speakers, and participants, and reinforcing the importance of such knowledge-sharing platforms in advancing defense technologies.

Glimpses of the Seminar

INAE Bangalore Chapter

VISHWA-2026: A National Science Day Celebration

MVJ College of Engineering, in collaboration with the Indian National Academy of Engineering (INAE) Bangalore chapter celebrated National Science Day by hosting VISHWA – 2026 on 13th March 2026 in Dr. M V Jayaraman Auditorium. The event was graced by Dr. B.N. Suresh, former president, INAE, Chancellor of IIST, Trivandrum and Chairman, Board of Governors, MVJCE, who presided as the Chief Guest and Dr. K.J. Vinoy, Chairman of the INAE Bangalore Chapter and Professor, Department of ECE, IISc Bangalore. Two Distinguished Lectures enriched the occasion, delivered by Shri P. S. Krishnan, Distinguished Scientist (Retd.) and former Director, ADE, DRDO, Bangalore, and Shri S. Mahesh Babu, Additional Project Director, Advanced Medium Combat Aircraft (AMCA). Their talks offered deep technical insights and real-world perspectives from India's cutting-edge defence and aerospace programs. The event was also graced by the presence of Dr. K. Ramachandra, Former Director, GTRE, Bangalore and Member, Board of Governors, MVJCE, along with Shri S. Ramanathan and Dr. K. G. Narayan, who honoured the occasion with their participation. The guests arrived at the auditorium at around 10:30 AM, marking the formal commencement of the event. Prof. Devika K extended a warm welcome to the distinguished guests, setting a gracious tone for the proceedings. The program began on an auspicious note with the lighting of the lamp by the dignitaries, accompanied by an invocation song rendered melodiously by Sriraksha and Arpita, students from the CSE and EC (ACT) departments.

Dr. B N Suresh, Former President, INAE, Chancellor of IIST, Trivandrum and Chairman, Board of Governors, MVJCE lighting the lamp as the Chief Guest

Following this, the Principal, Dr. Ajayan K R extended a cordial welcome to the esteemed dignitaries by presenting flower bouquets and delivered the official welcome address, acknowledging their presence and highlighting the significance of the occasion.

Principal, Dr. Ajayan K R presenting a bouquet to Dr. B.N. Suresh

Dr. M. Brindha, Dean – Administration, introduced the Chief Guest, Dr. B.N. Suresh, highlighting his remarkable achievements and contributions to the fields of science and technology. Following this introduction, Dr. Suresh delivered the Inaugural Address, inspiring the audience with his insights and vision.

Dr. M Brindha, Dean-Administration introducing Dr. B. N. Suresh, Chief Guest

Dr. B.N. Suresh opened his address by highlighting the significance of National Science Day, celebrated in honour of Sir C. V. Raman, India's only Nobel laureate in science for work conducted within the country. He congratulated the young students and researchers, emphasizing that choosing science and technology provides them with the unique opportunity to contribute meaningfully to the nation's growth.

Dr. B.N. Suresh, former President, INAE presenting the Inaugural address

Dr. Suresh reflected on India's remarkable progress across sectors such as space, defence, agriculture, industry, and atomic energy since independence. He noted that India now stands at a pivotal phase, driven by strong economic growth, innovation, and technological capability. He expressed pride in India's expanding innovation ecosystem and highlighted advancements in defence technologies, cybersecurity, information sciences, and pharmaceuticals. Addressing the youth, Dr. Suresh urged them to nurture curiosity, strengthen scientific temper, and aspire to achieve breakthroughs—perhaps even aiming for India's next Nobel Prize in science. Concluding his speech, he affirmed that the coming decades would be a golden era for science and technology, calling upon students to play an active role in shaping the nation's future. As a token of gratitude and respect, the Chairman Shri. M J Balachandar felicitated Padma Bhushan Dr. B.N. Suresh with a memento and a Ponnadai.

Shri. M J Balachandar felicitating Dr. B. N. Suresh, former President, INAE

Prof. Devika K introduced Dr. K. J. Vinoy, Chairman of the INAE Bangalore Chapter and Professor, Department of ECE, IISc Bangalore to the gathering and invited Dr KJ Vinoy to deliver the Opening Address. Dr. K. J. Vinoy delivered the Opening Address, expressing his happiness at being part of VISHWA for the second consecutive year. He appreciated MVJCE's continued collaboration with INAE in celebrating National Science Day and promoting scientific awareness among students. He highlighted the chapter's initiatives in organizing nationally significant events—such as National Engineers' Day, World Environment Day, and National Technology Day—and shared plans to extend these activities across Karnataka to widen their impact.

Dr. K. J. Vinoy, FNAE, Chairman of the INAE Bangalore Chapter delivering the Opening Address

Dr. Vinoy emphasized the importance of motivating the younger generation to pursue careers in science, engineering, and technology, reiterating the role of students in realising India's Vision 2047. Referring to the expert sessions, especially those on aerospace technologies, he encouraged students to actively explore emerging research opportunities and make use of the strong aerospace ecosystem around them. He commended MVJCE for its efforts in organizing the event and assured INAE's continued support in fostering scientific curiosity and innovation among students. As a token of gratitude and respect, the Principal, Dr. Ajayan K R Felicitated Dr. K J Vinoy with a memento and a Ponnadai.

Principal, Dr. Ajayan K R Felicitating Dr. K J Vinoy

Following this, the Distinguished Lecture Series commenced. The first lecture, titled was presented by Shri P.S. Krishnan, Distinguished Scientist (Retd.) and former Director, ADE, DRDO, Bangalore, who was formally introduced to the audience by Prof. Devika K. Shri P. S. Krishnan delivered an insightful lecture titled "Perspectives of UAVs in India" as part of the Distinguished Lecture Series. He provided a clear overview of UAV fundamentals, explaining what UAVs are, how flight is initiated, and the role of feedback control, Digital Flight Control Computers (DFCCs), sensors, and actuators in ensuring stability and navigation.

Shri P. S. Krishnan delivering his lecture on "Perspectives of UAVs in India"

He highlighted the growing importance of UAVs, particularly for continuous surveillance and strategic operations, and explained their USPs and Concept of Operations (CONOPS). The talk featured several indigenous UAV systems developed by ADE, including Lakshya, Nishant, and other successful platforms. He also discussed prominent ongoing projects like Rustom-1, Controlled Aerial Delivery Systems (CAD), Sudarshan, TAPAS, Nirbhay, and Ulka. His lecture further covered the basics of flight control systems, key concepts of control theory, the roles of gyroscopes, air data sensors, and the stages

of system design through systems engineering. He illustrated how sensor characteristics affect modal damping, linking theory to practical design challenges.

In conclusion, Shri Krishnan reinforced the Perspectives of UAVs in India by summarising how UAV technologies are evolving in the country and emphasising their growing importance in strengthening India's technological future. As a token of gratitude and respect, Dr. BN Suresh felicitated Shri PS Krishnan with a memento and a Ponnadai.

Dr. B N Suresh felicitating Shri P S Krishnan

Moving on to the next session of the lecture series, Prof. Devika K introduced Shri S. Mahesh Babu, Additional Project Director, Advanced Medium Combat Aircraft (AMCA), and invited him to deliver his lecture. Shri S. Mahesh Babu delivered an engaging lecture titled "Development of 5th Generation Fighter Aircraft – Engineering Challenges" He began by outlining the transition from the Light Combat Aircraft (LCA) program to the more advanced AMCA platform, placing India's efforts in the global context of 5th-generation fighters. He discussed the key features, specifications, and capabilities envisioned for AMCA, along with its core design philosophy and complete design lifecycle.

Mr. S. Mahesh Babu, Additional Project Director, AMCA delivering lecture on "Development of 5th Generation Fighter Aircraft – Engineering Challenges."

Dr. K Ramachandra felicitating Mr. S Mahesh Babu

He highlighted the innovative modular design of AMCA, comprising 9 major modules and 22 sub-modules, and explained the complexity of its manufacturing processes and maintainability requirements. The audience also gained insights into the cockpit layout, ergonomic studies, Diverterless Supersonic Intake (DSI), scoops and fairings, and the total count of 6205 major structural parts supported by 55 jigs for structural assembly.

Shri Mahesh Babu offered an in-depth overview of the various inboard systems that make AMCA a next-generation platform. These included the fuel system for uninterrupted supply, hydraulic systems, the Advanced Life Support System (ALSS), secondary power system, aircraft escape mechanisms, landing gear arrangement, brake parachute system (BPS), and the fire detection, warning, and extinguishing system. He also discussed the propulsion system, advanced avionics suite, integrated weapon systems, conformal VOR/ILS antenna, Electronic Warfare (EW) systems, and the AESA Radar. Further, he explained the electrical systems architecture, the Simulation Test Rig used for validation, and the incorporation of Industry 4.0 technologies in AMCA development. His lecture provided students with a comprehensive understanding of the engineering challenges involved in creating a 5th-generation fighter aircraft and showcased India's growing capabilities in cutting-edge aerospace technologies. As a token of gratitude and respect, Dr. K Ramachandra felicitated Shri S Mahesh Babu with a memento and a Ponnadai.

Following the lecture series, an interactive Q&A session was conducted, during which students enthusiastically engaged with the speakers. They raised numerous questions related to UAV technologies, fighter aircraft design, system engineering challenges, and the future of aerospace innovations in India. The experts responded with detailed explanations, addressing both technical and conceptual queries, which helped deepen the students' understanding. The session created a vibrant learning atmosphere and reflected the keen curiosity and active participation of the audience

Interactive Q&A session

Dr. M Brindha, Dean- Administration delivered the Vote of Thanks, expressing heartfelt appreciation to all the distinguished guests and the speakers for their invaluable contributions to the success of the program. She acknowledged the insightful lectures delivered by the esteemed speakers, the support extended by the management, and the enthusiastic participation of the students.

INAE Kolkata Chapter

First Science and Technology Lecture for School Children: Talk by Professor Saptarshi Basu at Garden High School IISER-Kolkata Campus on January 5, 2026

Indian National Academy of Engineering (INAE), Kolkata Chapter, in collaboration with Satikanta Guha Centre for Culture and Learning and the Indian Institute of Science Education and Research, Kolkata organized an outreach program for School Children at the Garden High School IISER Kolkata Campus on Monday, 5 January 2026. Highlight of the program was a motivational cum scientific talk titled "Van Gogh Meets Newton: Art in Science" by Professor Saptarshi Basu, *FNAE* and KSIIDC, Chair Professor, Department of Mechanical Engineering Indian Institute of Science Bengaluru. The program was inaugurated by the Prof. Sivaji Chakravorti, Vice President, INAE, and FNASC, President WAST, and Professor of Electrical Engineering Department of Jadavpur University. Prof. Debatosh Guha (*FNAE* and past Chairman, INAE Kolkata Chapter), and Mrs. Ratna Biswas, Principal GHS-IISER Kolkata Campus welcomed the attendees. Prof. Guha emphasized INAE's mission to spark an early interest in engineering among students. Prof. Guha also shared insights from Mr. N.R. Narayana Murthy (Chairman, Infosys), echoing the vision for the future of engineering discussed at the INAE Annual Convention 2025 held at the HAL Campus in Bengaluru. The event was also graced by Professor

Sanghamitra Bandyopadhyay, *FNAE,* FNASc, and former Director of ISI Kolkata, Professor Ranjan Ganguly, FNAE and Secretary, INAE Kolkata Chapter, Professor Ujjwal Maulik, *FNAE*, FNASc, Professor Mohit Prasad, Dean of Administration, and faculty of the Department of Biological Sciences, IISER Kolkata and several other faculty from IISER Kolkata.

During the talk, Professor Basu explored the fascinating intersection of aesthetic creativity and scientific inquiry, discussing how the pictorial representation of fluid vortices was indistinguishable from paintings like Van Gogh's 'Starry Night'. Through a series of high-speed videos and images, Prof. Basu unveiled the intricate ballet of liquid droplets, revealing new physics that underpin major technological advancements. From inkjet printing to pharmaceutical development, he showed how understanding the droplet behaviour is crucial. He also showcased how the fusion of art and science can lead to groundbreaking discoveries, echoing the styles of Van Gogh's swirling patterns and Newton's laws of motion. The lecture was chaired by Prof Debatosh Guha. The talk was followed by an intense Question-and-Answer session when the school children asked probing questions. The interaction session was as engaging as the main talk by Prof. Basu. The talk was also livestreamed, and archived at the INAE Kolkata Chapter's YouTube Channel. Following Prof. Basu's presentation, Prof. Sivaji Chakravorti and Prof. Sanghamitra Bandyopadhyay delivered brief but powerful motivational addresses. Sharing insightful anecdotes, they illustrated how science and technology serve as the primary engines for national transformation. Both speakers emphasized that the responsibility for this progress rests with the younger generation, encouraging them to lead the way into the future.

Nearly 300 students, coming from eight different schools from different parts of the District of Nadia, participated in the program. Notably, over one-third of the participants were girls, reflecting a strong interest in engineering and science among female students. The students were accompanied by their respective science teachers, ensuring a bridge between the event's insights and their classroom learning. The audience was further enriched by members of local Science Clubs and undergraduate students from IISER Kolkata, fostering a collaborative environment for scientific exchange. The program ended with a formal vote of thanks offered by Prof. Ranjan Ganguly, Secretary, INAE Kolkata Chapter.

Glimpses of the Science and Technology Lecture for School Children at Garden High School IISER-Kolkata Campus.

Inauguration of the program

Opening note by Prof. Debatosh Guha, FNAE

Lecture by Prof. Saptarshi Basu, FNAE

Address by Prof. Sivaji Chakravorti, Vice-President, INAE

Address by The Principal GHS-IISERK

The participants

National Science Day Lecture 2026 organized by INAE Kolkata Chapter

The National Science Day Lecture 2026 was successfully organized on 16 March 2026 at 12:00 noon at the Alumni Seminar Hall of Indian Institute of Engineering Science and Technology, Shibpur. The event was jointly organized by the Indian National Academy of Engineering (INAE), Kolkata Chapter, and IIEST Shibpur to commemorate National Science Day and to promote scientific awareness and innovation.

The program commenced with a Welcome Address by Dr. Ananya Barui, Head of the Centre for Healthcare Science and Technology (CHST), who warmly welcomed the distinguished guests, faculty members, researchers, and students present at the event. This was followed by a Program Introduction by Prof. Debatosh Guha**,** Former Chairman of INAE Kolkata Chapter, who spoke about the importance of celebrating National Science Day and highlighted the role of engineering and scientific innovation in addressing global challenges. The Inaugural Address was delivered by Prof. V.M.S.R. Murthy, Director of IIEST Shibpur. He emphasized the importance of interdisciplinary research, technological innovation, and academic collaboration in building sustainable solutions for societal needs.

The highlight of the event was the Keynote Lecture delivered by Prof. Sivaji Chakravorti from the Department of Electrical Engineering, Jadavpur University. His lecture titled *"*Sustaining the Planet: India's Frugal Innovation Blueprint*"* highlighted how resource-efficient and cost-effective innovations developed in India can contribute to environmental sustainability and global development. The lecture provided valuable insights and inspired the audience to explore innovative engineering solutions aligned with sustainability goals.

The event was attended by more than 100 postgraduate and PhD students**, along with** distinguished faculty members of IIEST Shibpur, making the session highly interactive and intellectually engaging. The program concluded with a Vote of Thanks delivered by Prof. Ranjan Ganguly from the Department of Power Engineering, Jadavpur University, who expressed sincere gratitude to the speakers, organizers, and participants for making the event a successful and enriching academic gathering.

Glimpses of few moments during the National Science Day Lecture organized by INAE Kolkata Chapter and IIEST Shibpur

Program introduction by Prof. Debatosh Guha, former Chairman of INAE Kolkata Chapter

Inaugural Address by Prof. V. M. S. R. Murthy, Director of IIEST Shibpur

Science Day Lecture by Prof. Sivaji Chakravorti, Vice-president, INAE

Interaction session at the end of the talk

INAE Forums

The following are the updates on activities carried out by INAE Forums during the period January to March 2026.

INAE Forum on Civil Infrastructure

The INAE Forum on Civil Infrastructure, consisting of domain experts had earlier undertaken a study on the National status of 'Urban Transportation' and 'Housing in India' – the challenges being faced, and, the possible way forward to tackle these. The Forum undertakes comprehensive studies of the problem involving not only the engineering issues, but also other related ones such as, policy interventions needed, societal involvement, and, regulatory mechanisms. Currently the Forum is studying the vitally important subject relating to Sustainability of Civil Infrastructure, a subject of much contemporary concern. The study relates to such aspects as, infrastructure demand, impact of infrastructure on environment, life cycle cost analysis, suitability for use of construction materials and technology. The main objective of the forum is to create "White Papers" from its study to provide a set of needed actions, related to, Policy Initiatives, Engineering Development/Research, Education.

The Forum held a series of meetings to review the progress of its ongoing study on issues related to civil infrastructure in India and to deliberate on the preparation of a comprehensive report. The meetings were attended by members of the Forum along with invited experts, and detailed discussions were held on the structure and content of the proposed report. Emphasis was placed on integrating technical aspects with broader considerations relating to policy, regulatory frameworks, and societal engagement in infrastructure development. In order to enrich the report with relevant and updated information, members were requested to interact with institutions and experts working in related fields. Inputs were sought from organizations dealing with buildings, transportation, sustainability, and construction technologies. Discussions were also held on establishing relationships between projected material requirements, costs, and the associated carbon footprint of infrastructure development, particularly in cement, steel, and other construction materials, as well as the need to consider emerging sustainability concerns such as embodied carbon and environmental impact. The Forum emphasized that the scale and unique context of the Indian infrastructure scenario must be carefully taken into account.

The recommendations emerging from the study are expected to be prioritized, with those considered most critical for implementation in the next five to ten years receiving the highest priority. The Forum considered the possibility of preparing case studies related to infrastructure projects, such as buildings and bridges, which could illustrate practical approaches to reducing carbon footprints and improving sustainability in the built environment. The report is under preparation and shall be finalized shortly. The Forum is nearing completion of its report and held rigorous deliberations with experts on 30 January 2026, 24 February 2026, and 13 March 2026 to finalize the report on "Sustainability of Civil Infrastructure.

During the Governing Council meeting on March 21, 2026 the concept of INAE Forums was reviewed. The genesis of this initiative is certain INAE Forums had earlier brought out pertinent reports including technology roadmaps on topical issues however, most had completed/exceeded their tenure and therefore, proposals for new Forums are being invited with slightly revised guidelines and format as approved by the Governing Council during the meeting. The objective of the forums is development of a policy document on selected engineering theme or domain to help the country (government, funding agencies, educational institutions, research organizations, industry and users) formulate a policy, strategy and roadmap for immediate or distant future. Proposals for constituting of INAE Forums on topics of engineering and technological interest to society have been invited on the revised guidelines and format by the last date of July 15, 2026.

INAE Schemes

Mentoring of Engineering Students by INAE Fellows/Young Associates

Applications for the year 2026–27 under the scheme "Mentoring of Engineering Students by INAE Fellows/Young Associates" were invited during February 5, 2026. The last date for receipt of nominations had been extended to May 3, 2026.

INAE Joint Consultative Committees:

To align the activities of the Academy with the thrust areas of National engineering interest in the policy domain, Joint Consultative Committees have been constituted by INAE for engagement with key Government Departments. The Consultative Committees with DST, ISRO, DRDO, DAE, CSIR and AICTE has been proposed/finalized for this year**.** These committees are co-chaired by the President, INAE and the head of the respective Department/establishment. A meeting with Secretary, DST (for DST-INAE Consultative Committee) and CEO, ANRF was held on February 11, 2026 with the President, INAE, wherein the roadmap and further way forward were discussed.

International Affairs

CAETS Energy Community

INAE being the only engineering academy of the country, represents India at the International Council of Academies of Engineering and Technological Sciences (CAETS); which is a premier non-governmental international organization comprising of Member Academies from 31 countries across the world. CAETS has several working groups and committees/community which work towards the to the advancement of science and technology and promoting sustainable economic growth of all nations. One of such group is "Energy Community" which has participation from various countries. This year, CAETS Energy Community is being chaired by INAE. Mr Pradeep Chaturvedi, Vice-President, INAE and Dr Ajay Mathur, FNAE are the co-chairs of this community. An initial meeting with Co-chairs and members from Canada, France and Croatia which were the participating members of the core group, was held on January 2, 2026 wherein it was decided to formulate an approach for next steps. Accordingly, several internal meetings of co-chairs were held and a concept paper was developed and circulated to all member academies for their comments/participation.

Bilateral Exchange Programme on "Critical Minerals" was jointly organised by the Royal Academy of Engineering (RAEng), UK and INAE during 9–11 March 2026

A Bilateral Exchange Program on "Critical Minerals" was jointly organised by the Royal Academy of Engineering (RAEng), UK and the Indian National Academy of Engineering (INAE), India during 9–11 March 2026. The bilateral exchange collaborative activity evolved as an outcome of the UK–India Technology Security Initiative (TSI) initiative between the two countries, wherein "Critical Minerals" was identified one of the key focus areas out of seven listed. The program aimed to facilitate dialogue between experts from academia, industry, government, and policy institutions from both countries on the strategic importance of critical minerals for the global energy transition, technological development, and supply chain resilience. This program was steered by Mr Pradeep Chaturvedi, Vice President, INAE.

The event was technically curated by the technical leads of the two academies – Dr Pradip, FNAE, Former Vice President, Tata Consultancy Services Ltd, Tata Research Development and Design Centre (TRDDC) & Former Vice-President, INAE and Professor David Knowles FREng, CEO, Henry Royce Institute from RAEng. The technical program from the INAE side was finalized by Dr Pradip, Prof Sukumar Mishra, Director, Indian Institute of Technology (ISM) Dhanbad, Prof BS Murty, and Prof Dheeraj Kumar, Head TEXMiN & Deputy Director, IIT (ISM) Dhanbad, steered by Mr Pradeep Chaturvedi, Vice-President, INAE.

A total of 15 technical experts within the Country were brought together by INAE to participate in the exchange program, most of whom were from industry. The event was initially planned to be held as in-person event, hosted by the Royal Academy of Engineering from March 9–11, 2026 in London. However, in view of the exigency situation in the Middle East, the event was accordingly conducted in a hybrid mode. Four Indian delegates participated in person in London, while nine joined virtually. The program and the coverage were curated by the technical leads of the two academies – Dr Pradip, FNAE from INAE and Professor David Knowles FREng, CEO, Henry Royce Institute from RAEng.

The program provided a platform to deliberate on emerging technological, economic, and geopolitical challenges associated with critical mineral supply chains and to identify opportunities for India–UK collaboration in exploration, processing, recycling, and digital supply-chain intelligence. The event included thematic technical sessions, industry interactions, policy discussions, and presentations on collaborative initiatives. The program has highlighted the growing importance of critical minerals in enabling clean energy technologies, advanced manufacturing, and digital infrastructure. A major focus of the discussions was the need to establish secure, diversified, and transparent supply chains for critical minerals such as lithium, cobalt, nickel, graphite, and rare earth elements. The increasing demand for these minerals driven by the rapid expansion of electric vehicles, battery storage systems, renewable energy technologies, and advanced electronics was highlighted.

An outline of deliberations, summary and outcomes of the joint exchange program containing excerpts from the Report are given below.

Strategic Outcomes, Value Proposition & A Collaborative Roadmap

Genesis:

1. It is a well-acknowledged fact that the foundations of our human civilization are the natural resources we have found and utilized for our well-being and growth. Currently, we are witnessing two revolutions in the making – one, the digital revolution including artificial intelligence, which is transforming the way we live, work, and communicate with each other, and the other is the energy transition, which is enabling the switch from fossil fuels to renewable energy-based electricity as the main source of energy for human living and growth. Both these revolutions are intimately connected and there is a synergy between the two but even more importantly, they have created a huge demand for certain specific elements – lithium, nickel, cobalt, vanadium and graphite (battery materials), neodymium, praseodymium, dysprosium, terbium (rare earth permanent magnets), gallium, germanium, indium, tellurium, scandium, selenium (electronics and semiconductors including PV Solar cells), titanium, niobium, tungsten, tantalum (structural materials), just to cite a few for illustration. Various countries around the world, including INDIA and the UK, are developing their own strategies to build robust, resilient supply chains for these critical minerals (as sources of much-needed specific elements), which also include international collaboration as an important part of these strategies.
2. Critical minerals, as sources of these specific elements, are thus becoming strategically essential to future economic resilience, technological advancement, and sustainability. The global critical minerals landscape is undergoing a profound structural transformation, driven by the accelerating energy transition, rapid technological advancements, increasing geopolitical realignments, and rising demands.

3. However, global supply chains for these minerals remain highly concentrated, opaque, and vulnerable to disruptions, underscoring the urgent need for a diversified, resilient, and transparent supply ecosystem.

4. Against this backdrop, both India and the United Kingdom have articulated on different forums their strong national priorities to secure and strengthen their critical mineral ecosystems:

a) ***India****, through the National Critical Mineral Mission (NCMM), is pursuing a comprehensive strategy encompassing exploration, resource development, circular economy, and supply chain intelligence, supported by policy reforms, international partnerships, and increasing industrial demand driven by its clean energy and manufacturing ambitions.*

b) ***The United Kingdom****, through its Modern Industrial Strategy and the UK–India Technology Security Initiative (TSI), is advancing its capabilities in critical mineral processing, advanced materials, recycling technologies, and supply chain risk intelligence, supported by a robust innovation ecosystem spanning leading universities, research institutions, and industry.*

5. Recognizing the strengths of our countries (India and the UK) in research, technology, demand, and deployment capabilities of advanced innovative solutions in this domain, both countries have been discussing the way forward, through various joint forums and meetings aimed at developing appropriate mechanisms for impactful collaboration between the professionals (academia, industry and research organizations) in both the countries working across the critical minerals value chain.

6. This evolving partnership is further reinforced by ongoing joint initiatives, including:

   a) The UK–India Critical Minerals Supply Chain Observatory aims to build shared digital intelligence and risk-assessment capabilities.
   b) The UK–India Critical Minerals Processing and Downstream Collaboration Guild (STRATA), facilitating industry-led partnerships, investments, and technology collaboration
   c) Expanding engagement between academic institutions, industry leaders, and government stakeholders

7. In this strategic context, the UK–India Bilateral Exchange Program on Critical Minerals (9–11 March 2026) was convened by the Royal Academy of Engineering (UK) and the Indian National Academy of Engineering (INAE) to provide a high-level platform for dialogue, knowledge exchange, and the co-creation of actionable pathways for collaboration.

8. The Exchange was conceived not merely as a forum for discussion, but as a catalytic step towards building a long-term, structured, and outcome-oriented India–UK partnership, anchored in:

   a) Supply chain resilience and transparency
   b) Circular economy and resource efficiency
   c) Advanced processing and materials innovation
   d) Shared digital intelligence and policy coordination
   e) Developing innovative solutions across the critical minerals value chain and their scale-up and commercialization with the help of innovative business models and appropriate policy initiatives.

9. A key area of focus during the discussions was an urgent need to make impactful advances in recycling and recovery of critical minerals from batteries, electrolysers, rare earth permanent magnets, E waste and other used industrial products containing critical minerals and metals highlighting the need to devote efforts towards recovery and reuse through improvements in technology readiness, regulatory frameworks, and market development, alongside opportunities to accelerate bilateral learning including around policy framework and skills development.

10. This brief report summarizes the strategic outcomes, value proposition, and a few recommendations for the way forward, with a view to developing policy, enabling partnerships, and guiding future bilateral initiatives in the critical minerals domain.

Summary of Deliberations (March 9-11, 2026)

11. The Bilateral Exchange Program (9–11 March 2026 – Hybrid Mode), jointly convened by the Royal Academy of Engineering (UK) and the Indian National Academy of Engineering (INAE), represents a strategic transition from dialogue to structured collaboration in the critical minerals domain.

12. Among the various issues deliberated upon during the meeting, it was clearly established that critical mineral security is no longer about access alone — it is about intelligence, processing capability, circularity, and system-level resilience.

13. This exchange also aimed to unlock India's vast critical mineral reserves and set out ambitions for the UK and India to reduce their current dependency on China. Business opportunities will be explored, including through processing agreements that can strengthen the UK–India industrial base and through regional hubs that can enhance leadership.

14. **Structure of the 3-Day Exchange (Hybrid Mode):** The program was structured across three tightly integrated layers:

    a) **Day 1 – Strategic & Technical Themes**
    The discussions on the first day were organized under the following 4 sessions, namely
    - Sustainable and Traceable Critical Minerals Supply Chains for the Energy Transition
    - Re-use, Recovery, Recycling of Critical Minerals
    - Designing for Resource Efficiency and Circularity in the Energy Technologies
    - Reducing Dependency on Scarce Materials

    b) **Day 2 – Industry & Institutional Engagement**
    - Interaction with Johnson Matthey (processing & materials innovation)
    - Engagement with the RA Eng partnerships team (industry-academia collaboration models)

    c) **Day 3 – Policy, Platforms & Way Forward**
    - UK priorities (Cabinet Office, DBT)
    - India's perspective (NCMM-aligned approach)
    - Observatory-led collaboration (Cambridge + IIT/TEXMiN – TTRP ecosystem)
    - Closing strategic outcomes

15. **Key Strategic Insights from the Deliberations:** Drawing strongly from the workshop flow and synthesis presented in the closing session:

    a) **Shift from Linear Supply Chains to System Resilience**

    The most important shift observed:

    - From "resource access" → "system resilience."
    - From "transactional sourcing" → "predictive, intelligence-driven supply chains."

    As highlighted in the closing outcomes, Traceability, stress-testing, and scenario planning must become central to mineral strategy.

b) **Circularity as a Strategic Imperative**

A unanimous position across sessions:

- Recycling, re-use, and recovery are not sustainability add-ons
- They are core instruments of supply security

This includes:

- Battery ecosystems
- Industrial residues
- Rare earth magnets
- Catalysts and advanced materials

c) **Digital Intelligence as the New Strategic Layer**

A critical emerging pillar:

- Shared data platforms and supply-chain intelligence systems
- Real-time mapping of:
  - Dependencies
  - Risks
  - Trade flows

16. The engagement revealed a way forward for strategic collaboration in certain selected areas. It is recommended that both the countries together create a joint India–UK critical minerals platform anchored around:

- Digital supply chain intelligence (Observatory-led)
- Joint R&D and pilot deployment
- Industrial-scale circular economy programs
- Strategic overseas asset partnerships

The UK–India Critical Minerals Supply Chain Observatory is positioned as a cornerstone initiative.

17. **Reducing Dependency through Innovation**

a) Beyond mining, discussions emphasized:

- Substitution technologies
- Material efficiency
- Next-generation chemistries

18. **Full-System Approach to Critical Minerals**

a) The exchange broadened the scope to include:

- Exploration
- Processing
- Recycling
- Standards
- Finance
- Data & governance

INDIA – Ongoing Critical Minerals Initiatives

19. **National Critical Mineral Mission (NCMM), launched in January 2025,** which aims to
    a) Enhance domestic exploration and mining of critical minerals (not only primary deposits but also secondary resources – abandoned mines, mine waste dumps, mine-tailings, smelter slag dumps, acid mine drainage, fly ash, red mud, and other accumulated waste)
    b) Development of appropriate mineral beneficiation, processing and extraction technologies and scaling them up to commercial success
    c) Recycling of critical minerals (recovery of critical elements from end-of-life products)
    d) Overseas acquisition of critical mineral assets through KABIL (Khanij Bidesh India Ltd)
    e) Research & Innovation (Creating Centres of Excellence to strengthen our technology capabilities, including human resource development and incubating startups – 9 of them functioning)
    f) Creation of Strategic Stockpiles of key minerals for supply security – National Critical Minerals Stockpile/Reserves
    g) The Centres of Excellence have been entrusted with the mandate to undertake innovative and transformational research to strengthen and advance the nation's science and technology capability in the area of critical minerals. Each centre will aim to reach TRL 7/8 for the technologies they work on, and it is expected that, in collaboration with their industrial partners, they will be able to set up pilot-plant-scale technology demonstration plants.

20. **Nine Recognized Centres of Excellence (CoEs) for Critical Minerals:**
    a) IIT Bombay: Focusing on advanced research, processing, and application.
    b) IIT Hyderabad: Specialized in material science and engineering for critical minerals.
    c) IIT (ISM) Dhanbad: Focusing on mineral exploration and beneficiation techniques.
    d) IIT Roorkee: Research on mineral extraction and processing efficiency.
    e) CSIR – IMMT, Bhubaneswar: Specializing in mineral processing and metal extraction.
    f) CSIR – NML, Jamshedpur: Focused on metallurgical innovations, smelting, and refining.
    g) NFTDC, Hyderabad: Dedicated to non-ferrous material development and technology.
    h) IISc Bangalore: Research on advanced materials and sustainable technology.
    i) C-MET Hyderabad: Specialized in electronics materials processing.

21. The proposed collaborative program between India and the UK must leverage the expertise available at these centres of excellence, as well as at several other laboratories and institutions, to launch a few collaborative projects of interest and value to both countries.

UK-based industries in the critical mineral space

22. The UK's advantage in critical minerals lies less in mining and more in processing, recycling, finance, and advanced materials integration**.** UK-based industries and companies actively working in the critical minerals space from exploration and mining through to processing, recycling, and supply-chain development
    a) **Cornish Lithium Ltd –** UK company focused on lithium exploration and extraction in Cornwall, including innovative direct lithium extraction technology.
    b) **Tungsten West –** Developer of the Hemerdon tungsten project in Devon, also exploring associated minerals, including lithium potential.
    c) **Cornish Metals** – Leading tin (and associated critical metals) mining and exploration company at South Crofty, part of the UK's critical minerals strategy

Rare Earths & Magnet Materials

- **Pensana Saltend (Pensana plc) –** Developing a rare earth processing plant at Salt End in Yorkshire to refine magnet-grade rare earth elements (neodymium, praseodymium), aiming for significant share of global output.
- **Less Common Metals (LCM)** – UK rare earth metals and alloys producer, active in refining and downstream materials (planning expansion beyond the UK).

Recycling & Circular Supply Chain

- **Hy Pro Mag Ltd** – UK company developing rare earth magnet recycling technologies, supported by innovation funding and working with partners.
- **Mint Innovation / Li Batt Recycling project** – EV battery recycling initiative in the West Midlands, backed by Jaguar Land Rover and government funding, aimed at recovering lithium, nickel, cobalt, and other critical metals.

<u>UK Critical Minerals – Value Chain Overview</u>

Upstream: Exploration & Mining

- Lithium, tin, tungsten (Cornwall & Devon)
- Players: Cornish Lithium, Cornish Metals, Tungsten West
- Support: British Geological Survey

Limited scale, long permitting timelines

Midstream: Processing & Refining (Key UK Strength)

- Rare earth separation & alloys
- Chemical processing clusters (Humber, Teesside)
- Players: Pensana (Saltend), Less Common Metals, Johnson Matthey

Critical bottleneck where the UK adds most strategic value

Downstream: Manufacturing & Use

- Automotive & EV supply chains
- Aerospace & defence alloys
- Advanced steels & magnets

Demand pull for secure, traceable supply

Circular Supply: Recycling & Urban Mining

- Battery recycling & rare earth magnet recovery
- Players: HyProMag, LiBatt, Mint Innovation

Fastest route to domestic critical-mineral supply

Enablers: Finance, Policy & Skills

- London mining finance & trading hub
- UK Critical Minerals Strategy
- Universities & innovation funding (UKRI, Exeter)

UK Catapults in Core Areas

23. One of the strengths of the UK Innovation Ecosystem is the Catapult's facilities (https://catapult.org.uk/about-us/why-the-catapult-network/), which include state-of-the-art infrastructure and expertise in certain areas. It is worth exploring whether bilateral collaborative programs can be developed to accelerate technology development and scale up solutions with support from the UK Catapults' infrastructure.

Attendees:

<u>List of Indian Delegates:</u>

INAE delegates who attended the in-person event in London:

1. Dr Vilas Tathavadkar, FNAE, Chief Technology Officer, Hindalco Industries Limited
2. Professor Ramaswamy Murugavel FASc FNA, Head, CoE on Critical Minerals, Metals, and Materials, IIT-Bombay
3. Dr. Samson Patole, FRSC, Principal Scientist, Tata Steel Research and Innovation Limited, United Kingdom
4. Mr. Kamisetty Yelaiah Vikram, Founder, Critical Mineral Trackers & Chairman & Managing Director, RESCMM (Rare Earths Strategic Critical Minerals, Metallurgical) and Technological Solutions Pvt Ltd

INAE delegates who attended the event in online mode:

5. Mr Pradeep Chaturvedi, Vice-President, INAE
6. Dr Pradip, FNAE - Delegation Lead, Former Vice-President, INAE; Former Vice President & Former Chief Scientist, Tata Consultancy Services Ltd, Tata Research Development and Design Centre (TRDDC); International Member, NAE, USA
7. Prof Sukumar Mishra, *FNAE,* Director, IIT (ISM) Dhanbad
8. Prof Dheeraj Kumar, Dy. Director & Project Director (Mining Technology Innovation Hub (TEXMiN), DST), IIT(ISM) Dhanbad
9. Dr. Sandip Ghosh Choudhury, *FNAE*, Director, CSIR-National Metallurgical Laboratory (NML), Jamshedpur
10. Prof KK Pant, *FNAE*, Director, IIT Roorkee
11. Dr. Venkataramana Runkana, *FNAE*, Chief Scientist, TCS Research
12. Prof. VMSR Murthy, *FNAE*, Director, Indian Institute of Engineering Science and Technology, Shibpur (IIEST)
13. Prof BS Murty, *FNAE*, Director, IIT Hyderabad
14. Dr. Chinmaya Kumar Sarangi, Senior Principal Scientist, CSIR- Institute of Minerals and Materials Technology (Formerly Regional Research Laboratory), Council of Scientific & Industrial Research, Bhubaneswar
15. Shri Muhammed Danish, CBDO, TEXMiN Foundation, DST, GoI

List of UK delegates

16. Professor David Knowles FREng, CEO, Henry Royce Institute (Technical lead)
17. Professor Frances Wall, Professor of Applied Mineralogy, University of Exeter
18. Professor Hylke J. Glass, Professor of Mining and Minerals Engineering, University of Exeter
19. Dr. Michael Turner Jones, Global Technical Director, Johnson Matthey
20. Professor Rebecca Lunn MBE FREng, Professor and Head of Centre for Ground Engineering and Energy Geosciences, University of Strathclyde
21. Dr Colin Church, CEO, The Institute of Materials, Minerals, and Mining (IOM3)
22. Dr Elizabeth Rowsell OBE, Corporate R&D Director for Johnson Matthey plc.
23. Professor Jeff Kettle, Professor of Electronic Engineering (Electronic & Nanoscale Engineering), University of Glasgow
24. Dr. Michael Keenan, Senior Principal Scientist, Ceres Power
25. Professor Magda Titirici, Professor of Sustainable Energy Materials, Imperial College London
26. Dr Gavin Harper, Engineering and Physical Sciences Faraday Institution Research Fellow, University of Birmingham
27. Dr Mukesh Kumar, Director of Global Supply Chain Observatory, University of Cambridge
28. Ms Naomi Ettrick, UK Department for Business and Trade's International Policy Advisor on Critical Minerals
29. Mr. Simon Strickland, Critical Minerals lead at the UK Cabinet Office

Recommendations – The Way Forward for Collaborative Efforts Between the Two Countries

1. As an outcome of visit of Prime Minister of UK to India, certain initiatives on technology and innovation were agreed upon. One important outcome was initiatives like the UK–India Critical Minerals Processing and Downstream Collaboration Guild (STRATA) which can evolve into the primary platform for project identification, industry matchmaking, and co-investment structuring between India and the UK. This initiative can be further strengthened by integrating the National Academies of both nations in the said Guild.

2. **Expediting the launch of the UK-India Critical Minerals Supply Chain Observatory** – a program which has been in progress under the UK-India Technology Security Initiative, supported by the UK Department of Science, Innovation and Technology (DSIT) and brings together University of Cambridge, IIT Bombay, TEXMiN at IIT (ISM) Dhanbad and Gujarat Mineral Development Corporation (GMDC) as an industry partner and Google Cloud as the technology partner – we should also involve other academic institutions and industry partners in India as appropriate.

   It also emerged during the discussion that this important India-UK collaborative program can also be extended to build a comprehensive data repository (with necessary protocols built into the repository for context sensitive search) of various critical minerals available in India across various primary deposits, operating mines, mine waste, tailings, mine overburden, abandoned mines, acid mine drainage, waste slags, fly ash, red-mud etc. This data repository will be extremely useful to researchers who wish to leverage recent advances in AI/ML, hyperspectral imaging, drone-based exploration, and related technologies to identify new sources of critical minerals in India. The details will have to be worked out once it is approved, but the extension of the ongoing collaborative effort between the University of Cambridge and TEXMiN to explore new deposits will be of great interest and value.

3. Considering the current priorities of India and the UK in the domain of the critical minerals as well as the commitment of both the UK government and Indian government to strengthen our ongoing partnership, it is advisable to consider pooling together our resources from both the countries and embark on an India-UK Collaborative Centre of Excellence in Critical Minerals for promoting Innovation Across the Complete Value Chain- the details of the proposed centre can be worked out but we have a successful centre of this kind – CEFIPRA, which has been operating for decades now. The organizational structure of the center can be worked out, but it will, of course, have an executive council with professional leaders (from academia, research institutions, and industry) active in this domain from both countries.

   We must invite proposals, consisting of principal investigators from both the countries with at least one industrial partner – with a focus to start with, scaling up some of the proof of concepts to pilot plant or plant scale operations – the proposals must also include the development of a prefeasibility or feasibility or techno-economics of the plant operations (as applicable) – the list of challenge problems related to certain specific area of current priority can be prepared for funding - for instance,

   - Innovative technologies for battery recycling, alternative battery chemistries which reduce dependence on critical minerals,
   - Filling the gaps in the rare-earth magnets production value chain, including recycling of spent magnets,
   - Projects to help establish the full value chain to produce lithium-ion batteries, starting from exploration of new deposits to exploitation of current deposits available in India, to developing the full value chain from lithium minerals to high-purity lithium compounds needed for lithium-ion batteries and the production of lithium-ion batteries in India, the
   - Accelerated design, development and deployment of novel highly selective, green reagents for exploitation of India critical mineral resources.
   - Developing innovative technology solutions for recovery of critical mineral values from secondary resources which also include mine-waste, slags, fly-ash, red-mud, abandoned mines, acid mine drainage etc. besides of course end-of-life recycling of manufactured products
   - Innovative solutions to the challenging problems facing us in critical minerals domain by leveraging advances in AI-ML, including digital twins technology - for example in accelerated exploration, discovery, enhancing safety, energy efficiency and productivity of mining operations, accelerated design of novel reagents customized for a given deposit.

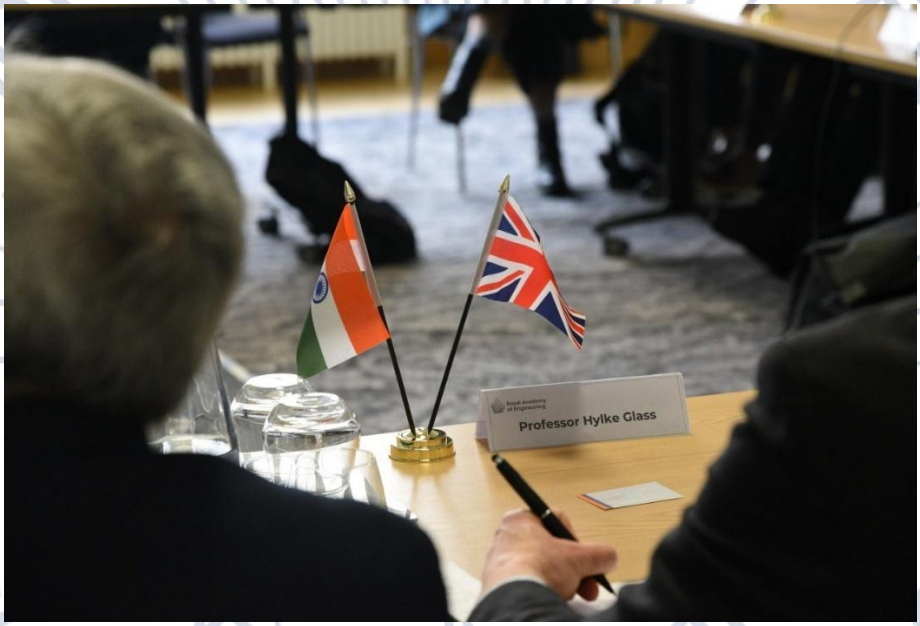
Appropriate IP agreements will have to be entered into by the collaborating partners and we must build appropriate protocols to facilitate it as part of the India-UK Collaborative Centre.

The proposed centre will also help develop the future professional leaders in this domain since it would not only target accomplishing certain ambitious goals in a time-bound fashion with appropriate monitoring mechanisms but will necessarily involve collaboration amongst several extremely competent professional leaders working in the industry or academic institutions in both countries and it will also include graduate students who will complete their Masters' or PhD theses (or post-doctoral fellows who will develop professional skills) while working on these projects and spending time in the reputed institutions as well as industries in both the countries, as an important component part of the project.

Our centres of excellence in this domain will provide the necessary support to embark on an ambitious program of collaboration between India and the UK in selected areas related to critical minerals, aiming to set up technology demonstration plants in each of those areas.

The proposed Indo-UK Centre can help create a database (which is continuously updated) for experts available in both countries, as well as the facilities available for testing & scale up (academic institutions/industries/national research and innovation institutions) to help those interested in building collaboration networks for specific problems/projects and/or scale up PoCs.

Some photographs of the event are given below:


Professor Hylke Glass

A copy of the post event report for the Bilateral exchange program on "Critical Minerals" can be viewed by clicking here……..

Election of Fellows and Foreign Fellows 2026

Nominations for Fellowship and Foreign Fellowship were invited in January 2026 with last date of March 31, 2026 which was extended to April 15, 2026. The first meetings of the 10 Sectional Committees to shortlist nominations for fellowship/Foreign Fellowship for Peer Review by selected domain experts were held online from May 15, 2026 to May 29, 2026.

INAE Young Engineer Award 2026

Nominations were invited for INAE Young Engineer Award 2026 with last date of March 31, 2026 which was extended to April 15, 2026. The nominations were collated and sent to the Members of the 10 respective Sectional Committee for initial screening and allocating marks against five chosen parameters which is ongoing. The nominations for INAE Young Engineer Award 2026 were shortlisted taking into consideration this marking during the first meetings of the 10 Sectional Committees held online from May 15, 2026 to May 29, 2026 for the shortlisted nominees to make presentation before a separate Selection Committee subsequently.

INAE Young Innovator & Entrepreneur Award

Nominations for INAE Young Innovator & Entrepreneur Award for the year 2026 were invited during February 5, 2026. The last date for seeking nominations had been extended to May 15, 2026. Further details included guidelines and application format may be viewed/downloaded from INAE website at the link https://www.inae.in/inae-innovator-entrepreneur-award/

INAE Publications

Transactions of Indian National Academy of Engineering – An International Journal of Engineering and Technology"

INAE is currently publishing a Journal named "Transactions of Indian National Academy of Engineering – International Journal of Engineering and Technology" published by M/s Springer which was earlier named INAE Letters. Transactions of INAE - Volume 11, Issue 1 March 2026 was published through Springer Publishers during the period January to March 2026. Further details are on Springer website at the link https://link.springer.com/journal/41403

INAE's Progress on Donations & Membership Schemes

In accordance with the directive from the Department of Science and Technology (DST) dated 6th May 2022, the Indian National Academy of Engineering (INAE) has moved towards full financial and functional autonomy, with government Grant-in-Aid concluding on 1st April 2025. To ensure long-term sustainability, INAE has implemented a strategic plan—endorsed by its Fellowship and approved by DST—centred around the creation of a dedicated Corpus Fund, supported by six key revenue streams:

- Corporate and institutional memberships,
- Individual donations/membership,
- CSR contributions,
- Government/project support, and
- Publication

INAE gratefully acknowledges generous contributions and commitments from leading corporates and institutions, including HAL, Google, Infosys Foundation, Microsoft, and others, as well as memberships from premier academic and research organizations. These contributions affirm strong confidence in INAE's mission and significantly support its journey toward financial self-reliance. INAE has 35 Institutional Members (28 Diamond, 1 Ruby, 6 Coral), and 252 Individual Members (165 Senior and 87 Associate). HAL has become Patron Corporate Member.

Donations to INAE Corpus Fund

INAE had faced an unexpected development because of the decision of the Government conveyed through the Department of Science and Technology that the funding of INAE would cease from April 1, 2025 onwards. Therefore, a lot of measures had to be taken to counter the situation and the Governing Council took the decision that INAE should raise its own corpus so as to become not only functionally but financially autonomous. A target to achieve about Rs 100 Crores was set so that the annual interest of Rs 5-6 Crores could meet the operational cost of the Academy. Since then, good progress has been made and substantial commitment and contributions have been received, which shall ensure the continuance of the Academy and that INAE would not only survive but thrive.

INAE leadership had appealed to the Fellowship for contributions to the INAE Corpus Fund, emphasizing the importance of collective support during the transition to financial autonomy. Contributions are seen as a shared responsibility of the entire Fellowship.

In recognition of donors, INAE has a **Wall of Donors** on its website at the link https://www.inae.in/wall-of-donors/

Account Details and QR code:
Account Name: INAE Corpus Fund
Account No.: 41790835603
Bank: Branch – NIHFW, Munirka (earlier old JNU), New Delhi
IFSC: SBIN0001624
Account Type: Savings

Tax Benefits:

Donations qualify for 50% tax deduction under Section 80G (for those under the old tax regime), with receipts and certificates issued within a quarter. INAE expresses deep gratitude to all supporters and continues to welcome contributions from Fellows, Young Associates, Awardees, and Corporate partners, which are essential to ensuring INAE's long-term self-reliance and mission continuity.

Important Meetings held during January to March 2026

Jan 2, 2026	Online Meeting of CAETS Energy Community
Jan 13 & 15, 2026	Meetings to discuss CEEE Program held over Webex
Jan 30, 2026	Meeting of INAE Forum on Civil Infrastructure held in hybrid mode
Jan 2, 9 & 28, 2026	Online Meetings to plan conduct of RAEng Bilateral Exchange program on "Critical Minerals"
Feb 10, 2026	Online Meeting to plan conduct of RAEng Bilateral Exchange program on "Critical Minerals"
Feb 11, 2026	Apex Committee Meeting held at New Delhi in hybrid mode
Feb 13, 2026	Online Meeting of Board of Management of CEEE program
Feb 10, 2026	Online Meeting of INAE Search Committee of Group I and II - Gender Parity
Feb 17, 2026	Online Meeting of Scouting Committee to identify nominees from Industry for Election to the Fellowship
Feb 21, 2026	Finance Committee Meeting
Feb 23, 2026	Discussion on CEEE-2026 program
Feb 24, 2026	Meeting of INAE Forum on Civil Infrastructure held in hybrid mode
Feb 25 & 26, 2026; Mar 2, 5, 9, & 10, 2026	Discussion to plan conduct of RAEng Bilateral Exchange program on "Critical Minerals" held over Webex
Feb 26, 2026	Meeting to discuss Social Media Strategy of INAE
Feb 28, 2026	Online Meeting to discuss plan for Foundation Day and Technology Conclave 2026
Mar 13, 2026	Meeting of INAE Forum on Civil Infrastructure held in hybrid mode
Mar 18, 2026	Meeting to discuss Social Media Strategy of INAE
Mar 18, 2026	Online meeting to discuss plan and coordination for CEEE-2026 program
Mar 18, 2026	RAEng Bilateral Exchange program on "Critical Minerals"- follow up meeting
Mar 21, 2026	158th Governing Council Meeting at new Delhi in hybrid mode

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INTERNATIONAL/NATIONAL CONFERENCES/SEMINARS BEING ORGANIZED BY IITS/OTHER INSTITUTIONS

1st International Conference on Advances in Networking, Intelligence, and Technological Systems (ICANITS 2026) being held online and in-person on 3rd to 4th July 2026 at Visakhapatnam, Andhra Pradesh.
https://www.anits.org/ICANITS2026/index.html

7th Rail MetroTech Expo India 2026- Exhibition being held in-person on 22nd to 24th July 2026 at New Delhi.
https://expo.railanalysis.com/

4th International Conference on Data Analytics and Insights (ICDAI-2026) being held online and in-person on 30th August to 1st September 2026 at Kolkata, West Bengal.
https://tint.edu.in/icdai/2026/index.html

International Conference on Innovations in Computing and Emerging Technologies- ICoICET 2026 being held online and in-person on 3rd to 5th September 2026 at Pune, Maharashtra.
https://mitaoe.ac.in/ICoICET-2026/

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Honours and Awards

(covering the period January to March 2026)

1	Prof. (Dr.) Ganapati D. Yadav, *FNAE,* Former Vice-Chancellor of the Institute of Chemical Technology (ICT), Mumbai; Bhatnagar Fellow; National Science Chair; Padma Shri awardee, and Chairman of BOG, LITU, Nagpur was selected for the prestigious Sir PC Ray Award by the Syndicate of the University of Calcutta. The award was conferred at the University's Convocation on March 23, 2026. Named after the legendary scientist Acharya Prafulla Chandra Ray the Sir PC Ray Award recognizes outstanding contributions to science and technology.
2	Prof R.N. Iyengar; *FNAE*, Distinguished Emeritus Professor, Centre for Ancient History & Culture, Jain University, Bangalore was awarded the SASTRA MAHAMANA Award of SASTRA University by Dr. S. Kalyanaraman, *FNAE,* CEO of ANRF on the National Science Day -February 28, 2026 for his excellent contributions in integrating traditional knowledge with modern Structural & Earthquake engineering research.

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ENGINEERING AND TECHNOLOGY UPDATES

Civil Engineering

1. IIT Guwahati Develops Smart, Naturally Cooling Bricks for Sustainable Architecture that Reduce Indoor Temperatures and Energy Use

Indian Institute of Technology Guwahati have developed energy-efficient bricks designed to keep buildings naturally cool, offering a promising solution for sustainable construction. In modern architecture, most infrastructures rely on air conditioning systems to maintain indoor temperatures, especially during the summer. While these systems are effective, they consume substantial electricity and contribute significantly to carbon emissions and environmental degradation. With a global focus on sustainable living and climate-responsive architecture, researchers worldwide are working towards finding alternative solutions to reduce indoor temperatures without relying on energy-intensive systems. As a significant amount of heat enters the infrastructure through its roof and walls, researchers at IIT Guwahati focused on addressing this challenge by redesigning conventional bricks to minimise heat gain. For the same, the research team, applied Phase Change Materials (PCMs), a type of material that can absorb and release heat during phase transitions. For example, materials such as wax absorb heat as they melt and release it upon solidification. Similarly, when embedded in building components, these PCMs absorb excess heat during the day and release it when the temperature drops. This way, the indoor temperature remains stable throughout the day. Among the various PCMs tested, the research team found OM35 to be the most suitable for the research. This material melts at around 35 degrees Celsius, making it particularly suitable for hot, humid regions where temperatures range from 28 to 38 degrees Celsius. While PCMs have proved to be a suitable choice for developing infrastructures for sustainable living, one primary challenge is their leakage during the melting phase. To address this, the research team developed a composite material by integrating the PCM with biochar. Biochar is a carbon-rich material that serves as a supporting matrix, holding the molten PCM in place and preventing leakage while enhancing thermal conductivity. The bio-composite PCM-filled AAC brick is very convenient to use in construction work. The AAC brick is known for their lightweight and better insulating properties. The integration of biocomposite PCM into AAC bricks further improves the building's thermal performance. Highlighting the key difference in conventional bricks and PCM-embedded bricks, a researcher said, “PCM-embedded bricks are capable of better thermal management in terms of temperature reduction, as they can absorb and store heat during the day and release it gradually when the temperature drops, helping maintain more stable indoor conditions compared to conventional bricks.” To ensure optimal design of the developed bricks, the research team used advanced computer simulations to track heat transfer through AAC bricks with different PCM configurations. Based on this, the researchers found that the developed bricks can reduce indoor wall temperatures by approximately 3 degrees Celsius. This reduction in indoor temperature can result in a 10 to 20 per cent decrease in cooling energy demand, depending on building design and usage patterns. The estimated cost of the developed bricks is in the range of Rs. 115 to Rs. 130 and is expected to decrease with mass production. As the next step, the research team plans to take this innovation to the commercial stage, likely by setting up a startup. The developed innovation has significant implications for energy savings, especially in hot and humid climates, where cooling accounts for a major share of electricity consumption. The new materials can reduce overall energy consumption and peak electricity demand by reducing reliance on air conditioning. The new method further improves climate sustainability by reducing greenhouse gas emissions from excessive energy use and by fostering energy-efficient, climate-sensitive buildings. Additionally, it supports the global initiatives of low-carbon construction and the sustainable urbanization of cities.

Source https://www.iitg.ac.in/iitg_press_details?p=221/iit-guwahati-develops-smart-naturally-cooling-bricks-for-sustainable-architecture-that-reduce-indoor-temperatures-and-energy-use

2. IIIT Delhi students bag first position in student track at AI for Bharat Hackathon

IIIT Delhi's student team has won the national AI hackathon with Bimasathi, an innovative insurance solution built to improve accessibility and efficiency, highlighting the power of technology in solving real-world challenges. Their winning solution, designed to improve insurance accessibility through AI, showcases how technology can create real impact at scale. Their outstanding coordination, technical expertise, and creative problem-solving helped them outperform nearly 96,000 developers from across India. This category focused on using artificial intelligence to improve accessibility, strengthen public services, and create community-driven solutions. The winning project, Bimasathi, is a WhatsApp-first insurance claim assistant built with voice-enabled and multilingual support features. The platform is designed to simplify and accelerate the insurance claim process, especially for users who face language barriers or digital accessibility challenges. The key features of Bimasathi are as follows: Voice-controlled claim assistance; Multilingual support; Easy WhatsApp integration; Faster insurance claim processing and Secure and user-friendly experience. Inspired by the success of digital payment systems like Unified Payments Interface, Bimasathi aims to bring a similar transformation to the insurance sector. The solution seeks to make insurance claims easier, faster, and more inclusive, particularly for underserved communities and first-time digital users across India.

Source https://www.indiatoday.in/education-today/news/story/iiit-delhi-students-bag-first-position-in-student-track-at-ai-for-bharat-hackathon-2897608-2026-04-17

Mechanical Engineering

3. **IIT Bombay Racing Showcases India's First Driverless Formula Student Car at Formula Bharat 2026**

The IIT Bombay Racing Team made a landmark impact at Formula Bharat 2026, achieving an outstanding 3rd Overall Finish while also securing 1st position in the Static Events category. Beyond competitive success, IIT Bombay Racing set a historic milestone for Indian Formula Student teams by unveiling India's first Driverless Formula Student car at the event. The showcase represented a significant step forward for autonomous vehicle development within the country's student engineering ecosystem and demonstrated the team's commitment to pushing technological boundaries beyond conventional racing formats.Formula Bharat, India's premier Formula Student competition, brings together top engineering institutions from across the nation to design, build, and validate high-performance formula-style race cars. While teams typically compete within predefined categories, IIT Bombay Racing took the initiative to present its driverless platform alongside the competition, offering fellow participants, industry experts, judges, and motorsport enthusiasts an opportunity to experience the future of autonomous mobility firsthand. The driverless vehicle integrates advanced perception, localization, and control systems developed entirely by students. The project reflects months of interdisciplinary collaboration, rigorous testing, and iterative engineering, aligning with global trends where autonomous systems are increasingly shaping the future of motorsport and mobility. By simultaneously excelling in competition and pioneering autonomous racing technology, IIT Bombay Racing has set a new benchmark for student-led innovation in India. The initiative aims not only to advance Formula Student participation but also to contribute to the broader development of autonomous vehicle research and talent within the country.

Source https://www.iitb.ac.in/breaking-news/iit-bombay-racing-showcases-indias-first-driverless-formula-student-car-formula

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4. IIT Guwahati Researchers Develop Low-Cost System to Remove 99% Arsenic from Groundwater

Indian Institute of Technology Guwahati researchers have developed a new system that can effectively remove 99% arsenic from contaminated water at a low cost. The electrocoagulation system has demonstrated the ability to remove contaminants within a few minutes, making it suitable for use in regions with limited access to complex water treatment infrastructure. Due to rapid industrialisation and urban growth, global reliance on groundwater has increased significantly. In many regions, groundwater contains arsenic released from natural rock formations or human activities such as mining and agriculture. Long-term exposure can cause serious health problems, including organ damage and cancer. To address this, many conventional methods have been developed, and while some have been successful, these are difficult to implement in uncontrolled environments. Most methods rely on the addition of chemicals, extensive treatment periods, and sophisticated equipment. Moreover, the methods need to be performed on site and have the potential to create surplus sludge, increasing the time and energy costs to disposal. Electrocoagulation offers a different approach. Instead of adding chemicals from outside, it uses an electric current to release metal ions from electrodes placed in the water. These ions attach to arsenic and other contaminants, allowing them to clump together and be removed from the water through settling or flotation. The process is relatively simple to operate and reduces the need for chemical handling. Traditional electrocoagulation systems use stationary electrodes, which can slow the process and cause deposits to form on the electrode surface over time, reducing efficiency. To overcome many of the noted system inefficiencies, the IIT Guwahati team, configured an electrocoagulation system with a rotating anode and a stationary cathode. Electrocoagulation, combined with a rotating electrode system, offers an efficient solution for arsenic-contaminated water. In this process, a controlled electric current dissolves a sacrificial iron electrode while its rotation enhances mixing and mass transfer, leading to uniform generation of iron coagulant species that effectively bind arsenic present in the water. Simultaneously, fine gas bubbles formed during the process attach to the arsenic-laden flocs and lifts them to the surface for easy separation. According to researchers, the use of rotating iron electrodes significantly improves removal efficiency while maintaining low operational cost, making the technology well suited for arsenic removal under optimised conditions. Laboratory tests using both synthetic water and real groundwater samples showed that the system could treat one cubic meter of contaminated water using only about 0.36 units of electricity. At prevailing electricity tariffs, this translates to a treatment cost of roughly Rs. 8–9 per 1,000 litres. Under optimised conditions, arsenic concentrations were reduced to well below the World Health Organization's guideline of 10 micrograms per litre within two to three minutes. The rotating anode system also produced significantly less sludge than conventional electrocoagulation setups, with faster settling and easier handling. The EC technology is a cost-effective alternative to conventional membrane and adsorption systems, particularly for arsenic removal. For a small community-scale plant (10–50 kilolitres per day), an EC system typically costs Rs. 8–15 lakh, while a conventional system costs between Rs. 12–20 lakh. At medium-scale capacities (100–500 kilolitres per day), the EC system costs Rs. 30–80 lakh, whereas RO-based systems often exceed Rs. 1–2 crore. Operationally, the EC system does not require expensive membranes or frequent chemical dosing, and maintenance is largely limited to electrode replacement. In contrast, membrane systems include high operating costs due to membrane fouling, replacement, and energy-intensive operations. The developed technology is particularly suitable for rural and semi-urban areas, where affordability, robustness, and ease of operation are critical. As the next step, the team plans to test the developed system in real-field conditions and evaluate its long-term performance in groundwater containing multiple contaminants such as fluoride and iron.

Source https://www.iitg.ac.in/iitg_press_details?p=214/iit-guwahati-researchers-develop-low-cost-system-to-remove-99-arsenic-from-groundwater

Electrical Engineering

5. IIT-Madras Develops Indigenous Power System for Plasma Thrusters in Small Satellites

Researchers at Indian Institute of Technology Madras have developed a compact high-voltage electronic system that could help small satellites manoeuvre more efficiently in space while using far less power. Researchers said the technology could reduce the size, cost and complexity of spacecraft propulsion systems while promoting more energy-efficient designs. IIT-Madras has unveiled a pioneering electronic system designed to power Pulsed Plasma Thrusters (PPTs) for small satellites. This development marks a significant stride in India's efforts to enhance indigenous space technology, particularly in the domain of satellite propulsion. PPTs are compact propulsion devices that use short bursts of plasma to generate thrust, making them ideal for manoeuvring small satellites in orbit. The newly developed system addresses a critical challenge in satellite propulsion: the need for lightweight, efficient, and reliable power sources. Traditional propulsion systems often demand bulky hardware and consume considerable energy, which is impractical for small satellites. By contrast, the IIT-Madras innovation provides a streamlined electronic solution that enables precise control over plasma pulses, thereby improving efficiency and reducing power consumption. This advancement is expected to have wide-ranging applications in the growing small satellite sector. With the increasing demand for CubeSats and nano-satellites in scientific research, communication, and Earth observation, the ability to manoeuvre these satellites effectively is crucial. The electronic system from IIT-Madras could allow Indian satellites to perform orbital adjustments, collision avoidance, and end-of-life de-orbiting with greater ease. The project also reflects India's broader ambition to strengthen its position in the global space industry. By developing indigenous propulsion technologies, the country reduces reliance on foreign systems and enhances self-reliance in critical space infrastructure.

Furthermore, the innovation aligns with the government's push towards encouraging academic institutions to contribute directly to national space missions. Beyond its immediate technical benefits, the system demonstrates the potential of academic research to produce practical solutions for real-world challenges.

Source https://www.tribuneindia.com/news/science-technology/new-super-capacitor-to-provide-electric-vehicles-with-increased-range-and-faster-acceleration/

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6. India approves first Mini/MicroLED fab; can Crystal Matrix deliver on its big semiconductor promise?

India's first commercial mini and micro light-emitting diode LED display manufacturing facility is set to be built at Dholera, Gujarat, by Hyderabad-based Crystal Matrix Ltd (CML) under the India Semiconductor Mission (ISM). Alongside Crystal Matrix, the government also approved Surat-based Suchi Semicon Private Ltd outsourced semiconductor assembly and test (OSAT) facility focused on power and automotive chips. Mini and micro-LEDs are semiconductor electronic components that are smaller, brighter and more energy-efficient than conventional LED panels. These next-generation display technologies are increasingly finding applications in premium televisions, smartwatches, AR/VR devices, automotive dashboards and wearables. According to the government announcement, the proposed facility will use Gallium Nitride (GaN) technology and target an annual production capacity of 72,000 square metres of display panels and 24,000 RGB wafer sets. The company described its business as the "manufacture and designing of LED, LCD and other display systems," without explicitly referencing GaN, Mini LED, MicroLED or semiconductor fabrication activities in its filings. While Crystal Matrix currently does not have a visible semiconductor manufacturing track record, the company has two listed South Korean technology partners: Lumens, an LED technology specialist, and Soft-Epi, a GaN epitaxy company. To be sure, the company's key management and advisory team appear to be taking shape around semiconductor manufacturing expertise. Soft-Epi gives Crystal Matrix the physics advantage, epitaxy and RGB, while Lumens provides the system advantage, display and IP. Together, they make the project credible.

Source https://www.businesstoday.in/technology/story/india-approves-first-minimicroled-fab-can-crystal-matrix-deliver-on-its-big-semiconductor-promise-530497-2026-05-08

7. ISRO successfully conducts 2nd integrated air drop test for Gaganyaan mission

The Indian Space Research Organisation (ISRO) on December 24, 2025 successfully launched a next-generation US communication satellite BlueBird Block-2 onboard its heaviest vehicle LVM3-M6 from Sriharikota in Andhra Pradesh. The launch took place from the Satish Dhawan Space Station at 8:55 AM Indian Standard Time. After a flight journey of about 15 minutes, the spacecraft Bluebird Block-2 was separated from the vehicle and it was successfully placed into its intended orbit. Speaking on the occasion, ISRO Chairman Dr V Narayanan has hailed the successful launch of the BlueBird Block-2 communication satellite of US-based AST SpaceMobile, calling it the heaviest satellite ever lifted from Indian soil using an Indian launcher. He highlighted that the satellite was injected into its intended orbit with precision, marking a significant achievement for ISRO. The Bluebird Block-2 mission is part of a global LEO (Low Earth Orbit) constellation to provide direct-to-mobile connectivity through satellite. This constellation would enable 4G and 5G voice and video calls, texts, streaming and data for everyone, everywhere at all times. The mission was undertaken as part of the commercial agreement signed between NewSpace India Ltd (NSIL) and US-based AST SpaceMobile (AST and Science, LLC). NewSpace India Ltd is the commercial arm of ISRO. The LVM3-M6 is the sixth operational flight of LVM3 and the third dedicated commercial mission to launch the Bluebird Block-2 spacecraft. The LVM3 has a spectacular pedigree of completing eight consecutive successful launches, including the ambitious Chandrayaan-2 and Chandrayaan-3 missions.

Source https://www.newsonair.gov.in/isro-to-launch-bluebird-block-2-satellite-on-lvm3-m6-mission-today/

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8. Scientists discover way to make Aluminium batteries affordable and safer, offering alternative to Lithium

Indian scientists have developed a new composite electrode material that can prevent cracks and damages in aluminium ion batteries and make them affordable, safe and long-lasting, thereby offering a safer and eco-friendlier alternative to lithium-ion batteries, Aluminium-based batteries are gaining increasing attention across the globe. Aluminium is one of the most common metals on Earth, easy to find, inexpensive and having the capacity to store a larger amount of electrical charge than lithium. Aluminium batteries could become an attractive option for future energy storage technologies because of these advantages, but developing practical aluminium batteries has been challenging. The material inside these batteries breaks down quickly during charging and discharging. Over time, the material that stores energy can crack or dissolve into the liquid inside the battery causing the battery to lose its power fast. A popular material called vanadium oxide used for cathode can store a large amount of energy but in water-based aluminium batteries, this tends to dissolve into the battery liquid and as a result the battery loses capacity very quickly and cannot maintain stable performance for long periods. To address this long-standing challenge, a research team from the Centre for Nano and Soft Matter Sciences, Bengaluru, worked in collaboration with researchers from Manipal Academy of Higher Education, Manipal, Academy of Scientific and Innovative Research, Ghaziabad and Shiv Nadar Institution of Eminence, Greater Noida. The team combined vanadium oxide with another layered material known as MXene, an extremely thin material that can conduct electricity very efficiently. When these two materials were combined, MXene formed a supportive and conductive network that helped hold the vanadium oxide in place. This design reduced the amount of vanadium that dissolves into the battery liquid by almost 80 percent. The battery was able to operate for a much longer time because of this improved stability. “It demonstrated exceptional stability achieved by suppressing vanadium dissolution, maintaining 73.23 percent capacity after 100 charging cycles and remarkable long-term performance with 59.2 percent retention after 500 cycles,” the researchers said in their study. “We are on the cusp of a new era in energy storage, due to excessive exploitation of oil resources, where alternatives to lithium-ion technology are poised to take the spotlight. One promising contender that has garnered significant interest among researchers is the rechargeable Aluminium-ion batteries, offering a promising substitute to traditional lithium-ion technologies,” the researchers observed.

Source https://www.tribuneindia.com/news/science-technology/scientists-discover-way-to-make-aluminium-batteries-affordable-and-safer-offering-alternative-to-lithium/

9. India marks major nuclear milestone as indigenously built Prototype Fast Breeder Reactor in Tamil Nadu's Kalpakkam attains criticality

India has recently marked a major milestone in its nuclear energy programme as indigenously designed and built Prototype Fast Breeder Reactor (PFBR) at Kalpakkam in Tamil Nadu attained criticality. The 500 Megawatt electric Prototype Fast Breeder Reactor PFBR is located at Kalpakkam in Tamil Nadu and operated by Bharatiya Nabhikiya Vidyut Nigam Ltd (BHAVINI). It represents a key component of India's long-term nuclear strategy. Once fully operational, India will become only the second country after Russia to have a commercial fast breeder reactor. Criticality marks the point at which a nuclear reactor achieves a self-sustaining chain reaction. This is a key milestone before full power generation, indicating that the reactor core is functioning as designed. It strengthens India's position in advanced nuclear technology and clean energy generation. The project has been built indigenously with contributions from over 200 Indian industries, including several MSMEs, aligning with the government's push for self-reliance under the Aatmanirbhar Bharat initiative.

Source https://www.newsonair.gov.in/india-marks-major-nuclear-milestone-as-indigenously-built-prototype-fast-breeder-reactor/

Interdisciplinary and Special Engineering Fields and Leadership in Academia, R&D and Industry

10. First-of-its-kind satellite by Indian start-up flies on SpaceX rocket

An Indian start-up, GalaxEye, rode on a SpaceX on May 4, 2026 to launch a first of its kind satellite that is meant to fill a long-standing gap in space imaging. The satellite, aptly called Drishti, is equipped to take optical images, very much like a normal camera, as well as radar-generated images of the same place at the same time, something that has not been tried before. The optical images ensure clarity and intuitiveness, while radar images, through a Synthetic Aperture Radar (SAR), brings all-weather reliability. For this reason, the company is describing its innovation as Opto-SAR technology. Imaging satellites are generally equipped to take multi-spectral or hyper-spectral (optical) images, or they use SAR. Both of these kinds of satellite data are used extensively. But very often they need to be fused together to get correct information because each one of them has limitations. Multi-spectral images are clear and easy to understand, but they are not effective during cloudy weather or night time, for instance. SAR signals can penetrate clouds and take continuous images, but they are not intuitive. Like X-ray images, they need experts to glean the information. The uniqueness of Drishti is that it has both the sensors that will enable simultaneous imaging. Drishti is the first satellite of GalaxEye, a company started by alumni of IIT Madras. It rode on a Falcon 9 rocket by SpaceX from the Vandenberg Space Force Base in California, United States, as one of the 45 payloads on the CAS500-2 mission. The launch happened at 1230 pm India time. Drishti, a built-in-India satellite, seeks to solve a familiar problem in space imaging. Users need clear and intuitive images from space that is available at all times. As of now, they often have to use data from multiple satellites, optical data for clarity, and SAR data for continuity and all-weather availability. While the super-imposition of these two datasets often does the needful, it is not without challenges. The two satellites are not watching the same place at the same time, and the angles at which they are watching over a place on Earth can be very different. GalaxEye is one among several Indian space start-ups that are beginning to make their presence felt. Agnikul Cosmos, another start-up from IIT Madras, has built the world's first 3-D printed rocket engine, while Skyroot has tested India's first privately built rocket. Companies like Pixxel, Dhruva Space and Bellatrix have been demonstrating impressing innovations in satellite technologies. GalaxEye had to make important technological innovations to ensure that both the imaging sensors are put on the same satellite and operate in sync with each other to produce simultaneous imaging of the same place. The data produced by the satellite will be useful for civilian as well as military purposes.

Source https://indianexpress.com/article/india/galaxeye-drishti-satellite-spacex-launch-opto-sar-technology-explained-10669686/

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ENGINEERING INNOVATION IN INDIA

1. IIT Guwahati Develops Radiation-Resistant Cement Mortar for Safer Nuclear Facilities

With an aim to make nuclear facilities radiation-safe, researchers at Indian Institute of Technology Guwahati have developed a method to make cement mortar stronger, more durable, and better at blocking harmful radiation. The approach focuses on improving the material properties of the mortar so that it can perform both as a structural component and as a radiation-shielding barrier. By modifying the composition of the mortar, the researchers aimed to enhance its density and durability, which are important factors in limiting the penetration of radiation. Researchers have found that concrete made using this enhanced mortar is capable of reducing the risk of radiation leakage, thus improving the overall safety in locations such as nuclear reactors and other radiation-sensitive facilities. This could help create more reliable protective walls and structures in areas where radiation exposure needs to be strictly controlled. The development may also support long-term safety in such facilities by providing materials that can maintain their shielding performance over extended periods of use.

Nuclear disasters have shown that safety from radiation remains the utmost priority in nuclear energy systems. This depends on the strength of the materials used to build the power plant. Nuclear containment structures act as the protective barrier, designed to prevent radiation leaks during extreme events such as earthquakes, explosions, or sharp temperature changes. Cement mortar is a key ingredient in these structures. Therefore, improving the strength and radiation shielding of cement based materials is a essential to build a radiation resilient nuclear facility. As the world moves toward expanding nuclear energy to meet rising electricity demands and climate commitments, the safety and durability of nuclear infrastructure become even more critical. To address this challenge, the IIT Guwahati research team modified the cement mortar by combining it with four types of microparticles. These include - Boron oxide; Lead oxide; Bismuth oxide and Tungsten oxide. The research team added these microparticles in small amounts to test their effect on the cement mortar's compressive strength after 28 days. The team also tested each microparticle's ability to block mixed radiation fields containing gamma rays and neutrons.

The researchers found that each microplastic affected the mortar differently.

- Addition of lead oxide helped in making the mortar denser and stronger.
- Tungsten oxide increased the mortar's cracking resistance, making it more durable.
- Addition of boron oxide improved the mortar's protection against radiation.
- Tungsten oxide addition provided the broad-spectrum protection, blocking multiple types of radiation simultaneously.

By improving concrete's resistance to heat, structural loads, and radiation, this developed cement-mortar supports the creation of safer and more resilient facilities. To explore the real-world testing and validation of the developed technology, the research team is looking for collaborations with nuclear energy agencies, construction material manufacturers, and infrastructure companies involved in nuclear facility development. Discussions are underway to test the developed cement mortar under simulated field conditions and pilot-scale applications.

Source https://www.iitg.ac.in/iitg_press_details?p=220/iit-guwahati-develops-radiation-resistant-cement-mortar-for-safer-nuclear-facilities

2. IIT Gandhinagar PhD Scholar Develops Innovative Hydrogel Technology, Promising Safer, Minimally Invasive Surgeries

In a significant boost to India's biomedical innovation landscape, an Indian Institute of Technology Gandhinagar (IITGN) Research Team has developed an advanced injectable hydrogel technology with promising clinical applications. It represents a successful translation of laboratory science into patented biomedical technology with real-world potential. The smart biomaterial can support doctors during minimally invasive procedures, particularly in treating gastrointestinal conditions such as colorectal polyps—abnormal growths that can develop into cancer if not detected and removed early. Mr Harshil Dave, a second-year PhD scholar in the Department of Biological Sciences and Engineering at IIT Gandhinagar, has been awarded the Vikram Sarabhai Young Scientist Award 2026 for the research. Current clinical practice involves injecting fluids beneath such polyps to create a cushion for safe removal. However, commonly used solutions like saline are quickly absorbed and often require repeated injections, increasing procedural complexity. Addressing this limitation, this research introduces a next-generation injectable hydrogel that flows like a liquid during delivery but rapidly transforms into a stable gel inside the body. The developed hydrogel platform highlights the potential of minimally invasive biomaterials to enhance procedural safety while addressing critical challenges in cancer prevention and wound healing. The next goal of the researchers is to translate it into practical medical solutions that can benefit patients in real clinical scenarios. The researchers aim to advance the technology toward clinical translation, including further validation studies and preparation for human trials. With continued development, injectable biomaterials like these could transform how doctors perform minimally invasive procedures, improve cancer prevention strategies, and enhance recovery for patients worldwide.

Developed using a plant-based molecule called 'diglycerol monostearate', the shear-thinning hydrogel can be precisely injected through an endoscopic catheter, forming a durable cushion that enables surgeons to lift and remove polyps more safely. This reduces the risk of tissue damage and bleeding, potentially improving outcomes in minimally invasive gastrointestinal procedures. Beyond surgical support, the technology opens up broader possibilities in healthcare. The hydrogel platform has demonstrated potential in tissue regeneration and wound healing by creating a protective, moisture-rich environment that supports recovery. Its inherent antibacterial, antioxidant, and anti-inflammatory properties further enhance its suitability for biomedical use. Researchers believe such biomaterials could play a key role in early cancer intervention strategies, safer surgeries, and advanced drug delivery systems.

Source https://news.iitgn.ac.in/iit-gandhinagar-phd-scholar-develops-innovative-hydrogel-technology-promising-safer-minimally-invasive-surgeries/

Note: *Fellows are requested to forward their achievements/achievements of their organziation to be featured under the heading "Engineering Innovation in India".*

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