

Executive summary of these important activities and contributions made by INAE: 2023.

As we look forward to a new beginning, as a customary practice, please allow me to present an overview of the major initiatives and events of INAE in the calendar year that just concluded.

- The **National Science Day** was celebrated on 1st March 2023 through the Kolkata Chapter of INAE wherein Professor Sankar K Pal, FNAE delivered a talk on ‘Pattern Recognition, Machine Intelligence to Data Science: Evolution and Challenges’ and Dr. Arun Bandyopadhyay, Director, CSIR-Indian Institute of Chemical Biology (IICB) spoke on “R&D is not Driven by Profit Alone” at Indian Institute of Chemical Biology (IICB), Jadavpur, Kolkata. In addition, two Compendiums on “**Women Engineers in India Vol. I**” and “**Landmark Achievements in Engineering and Technology in Independent India**” along with the INAE Report on “**Technological Preparedness for Dealing with National Disruptions**” prepared by INAE under the aegis of the *Azadi ka Amrit Mahotsav* celebrations were released at the national level by Dr Jitendra Singh, the Hon’ble Minister of State (Independent Charge) for the Ministry of Science and Technology & Earth Sciences during the **National Science Day 2023** function organized by the DST on February 28, 2023, at Vigyan Bhawan, New Delhi. INAE is grateful to Prof Purnendu Ghosh, Prof Prem Krishna, and Dr PS Goel who steered the respective task forces of these volumes with able support from a selection of distinguished Fellows and Experts.
- The **37th Foundation Day Function** of INAE was held on 20th April 2023 at IIT Delhi in hybrid mode. The Guest of Honor, Prof Rangan Banerjee, FNAE, Director, IIT Delhi delivered a thought-provoking talk on “The Challenge of Net Zero and India’s Energy Transition” followed by another very enlightening address on “Climate Change and India’s Pathway” by the Chief Guest, Dr VK Saraswat, FNAE, Member, NITI Aayog.
- INAE celebrates four flagship events every year viz. National Frontiers of Engineering Symposium including Innovation in Manufacturing Practices, Youth Conclave, Engineers Conclave and Annual Convention. The 17th **National Frontiers of Engineering (NatFoE-23)** Symposium was organized by INAE in collaboration with Birla Institute of Technology (BIT) Mesra under the aegis of INAE-SERB Conclave on *Atmanirbhar Technologies-Engineering Secured Future* during June 24-25, 2023. Shri Jayant Sinha, Member of Parliament, Lok Sabha was the Chief Guest of the Inaugural Event, which was held on June 24, 2023. Shri Sinha delivered the inaugural talk on “Getting to the Green Frontier: A Net-Zero Development Model for India”. A National Competition on **Innovation in Manufacturing Practices (IMP 2023)** was also dovetailed with the NatFoE on June 26, 2023, to provide a platform for engineering students and startups to showcase their innovations in the manufacturing sector.
- The tenth **Engineers Conclave 2023** (EC-2023) was organized from October 5-7, 2023, at the prestigious Raja Ramanna Centre for Advanced Technology (RRCAT) in Indore. The two themes selected for this event, namely, “**Laser Technologies for Emerging Engineering Challenges**” and “**Engineering and Technology for Clean and Green India @2047**” attracted a large audience comprising staff scientists and engineers, researchers, practising engineers, and industry leaders to hear about newer technology frontiers emerging that can facilitate sustainable solutions in these two areas. The event was overall coordinated by RRCAT jointly with INAE and UGC-DAE-Consortium for Scientific Research (CSR), Indore, with active support from the Devi Ahalya Viswa Vidyalay and IIT Indore as the partner institutes. INAE is grateful to Prof AJ Pal, Director, UGC-DAE CSR, and Dr S V Nakhe, Director, RRCAT Indore, the respective Chairman and Vice Chairman of the Conclave for the excellent conduct and outstanding success of the conclave.

- **INAE Youth Conclave 2023** under the aegis of **SERB-INAE Innovation Hackathon** was held during November 3-4, 2023, at GITAM University, Vishakhapatnam. The theme of the conclave "**Innovation and Technology for Global Challenges**" highlighted the importance of technological advancements in addressing pressing global issues. The conclave focused on six key areas, each with profound implications for global problem-solving: AI in Healthcare; Space & Robotics; Green Energy and Storage; Circular manufacturing; Biomedical Engineering and Devices and Smart City & Urban Planning.
- INAE organized its **Annual Convention 2023** on December 9-11, 2023, at Siksha 'O' Anusandhan University, Bhubaneswar in association with IIT Bhubaneswar; CSIR-IMMT Bhubaneswar and INAE Bhubaneswar Chapter. This mega event was attended by the Fellows, Foreign Fellows, Young Associates, and Invitees. Forty eight distinguished professionals including nine iconic corporate leaders (vide Rule 37g) and five from foreign countries from the industry, academia and R&D, elected by the Governing Council in its meeting held on August 18, 2023, were inducted as the Fellows of INAE in this Convention. Fifteen Young Associates were also selected as per the new guidelines approved by the Governing Council this year. **Mr. TV Narendran, FNAE, CEO and MD of Tata Steel Limited**, the Chief Guest of the event delivered the Inaugural Lecture and spoke of the vital role of steel industry in the economic development of a nation. He opined that multidisciplinary activities are the need of the hour and INAE can play an active and holistic role in this regard. A Book on "**Diverse Space Applications**" authored by Dr. BN Suresh, Former President, INAE & Chancellor, Indian Institute of Space Science & Technology (IIST), Thiruvananthapuram was released which is a compilation meant to highlight the contributions of Indian Space program towards National development. Prof. GD Yadav, FNAE delivered the plenary talk on Talk on "**Green Hydrogen**" and Mr. S Somanath, Chairman, Space Commission, Chairman, ISRO and Secretary, Department of Space delivered a Special Talk on "**Chandrayaan 3: The Mission and its Accomplishments**" on the first day. The three-day event included two specially crafted Panel Discussions on "**New Tech industry**" and "**Artificial Intelligence in Industry 4.0 and Sustainability**" and brief presentations by the respective Conveners of the Engineering Sections on **Technology Gap, Forecasting, and Roadmap**. On the whole, the event was an astounding success, thanks to the diligent planning by the co-chairs of the INAE Annual Convention 2023, Dr Sanak Mishra, Former President of INAE, and Prof. Damodar Acharya from SOA University.
- The **INAE -SERB Abdul Kalam Technology Innovation National Fellowship** launched in 2017 is a flagship initiative of INAE, funded by SERB (DST), to recognize, encourage and support translational research by individuals working in various capacities of engineering profession in public funded institutions in the country. Ten new Kalam Fellows were selected this year on 29-30th August. Altogether, 57 professionals have been conferred this fellowship so far. At present, 45 fellows are on the roll. Several of the translational research projects pursued by these Kalam Fellows have reached the stage of technology transfer and creation of start-ups including filing up of 61 patents and setting up of a few technology ventures.
- I am glad to place on record that many **INAE Local Chapters** have become highly active in the last few years. Several of them have organized a large number of national or local level Webinars/Seminars/Memorial Lectures and INAE events during the last year. In particular, **INAE Women's Day Celebration** on the theme "**Women contributions in Engineering and Technology**" was organized by INAE Mumbai Chapter on 11th March 2023. The **second Professor Roddam Narasimha Memorial Lecture** on "**Swing, Reverse-Swing and Knuckle Ball: Transition of Boundary Layer**" was delivered by Prof. Sanjay Mittal, FNAE at CSIR-NAL, Bangalore on July 20, 2023. INAE Kolkata Chapter celebrated the **National Engineers' Day** on 15 September 2023 at MCKV College of Engineering, Howrah. On this occasion, Prof. Sivaji Chakravorti, delivered the Engineers Day Lecture on "**Evolution of the**

frequency at which we get the electrical power supply”. A Brainstorming Session on **“Innovative Pathways for Hydrogen Development”** was also jointly organized by INAE Delhi Chapter, International Solar Alliance (ISA) in association with INAE Forum on Energy held on November 17, 2023 at New Delhi. Dr Kirit Parikh, Former Chairman, IRADe and Member, Planning Commission was the Guest of Honour.

- INAE celebrated the **National Technology Day** on 11th May 2023 wherein Mr. MV Kotwal, *FNAE*, Ex-Member of the L&T Board & President Heavy Engineering delivered a special Talk online on **“Technology – A Prime Mover for Growth”**.
- INAE observed the **“National Engineers Day”** on 15th September, 2023, by organizing a Panel Discussion on **“Cyber Security and Cyber-Physical Systems”** addressed by four most eminent panelists, namely, **Dr Ajay Kumar**, *FNAE*, Former Secretary, Ministry of Defense; **Mr. K Ananth Krishnan**, *FNAE*, Formerly Executive Vice President and Chief Technology Officer, TCS, **Prof. Manindra Agrawal**, *FNAE*, Project Director, C3i (cybersecurity and cybersecurity for Cyber-Physical Systems) Innovation Hub and Professor, CSE, IIT Kanpur; and **Prof P. Rajalakshmi**, Director, NMICPS TiHAN Foundation Technology Innovation Hub on Autonomous Navigation and Data Acquisition Systems at IIT Hyderabad. **Prof. Anurag Kumar**, *FNAE*, Former Director, IISc Bangalore steered the panel discussion.
- INAE recognized as an advisory body to the Govt Departments/Agencies for providing inputs for engineering interventions to help solve problems on topics of current engineering interest. Joint Consultative Committees with **DST, Office of PSA, CSIR, ISRO, DRDO, AICTE, DAE and SERB**. Meetings of CSIR-INAIE Consultative Committee was held on February 27, 2023 and of SERB-INAIE Consultative Committee was held on March 6, 2023 to identify areas for conduct of technical activities/programs.
- INAE jointly with SERB had since the year 2022, conducted four specific national level schemes under the **SERB-INAIE Collaborative Initiative in Engineering**. These four initiatives under its aegis are **SERB-INAIE Conclaves on Atmanirbhar Technologies – Engineering Secured Future; SERB-INAIE Woman Engineers Program; SERB-INAIE Outreach Programs for the North Eastern States, Jammu & Kashmir and Ladakh** and **SERB-INAIE Innovation Hackathon**. A large number of events were organized under these initiatives in the year 2023. Under the **SERB-INAIE Conclaves on Atmanirbhar Technologies - Engineering Secured Future** the 17th National Frontiers of Engineering (NatFoE-23) Symposium was organized in collaboration with Birla Institute of Technology Mesra during June 24-25, 2023. A one-day National Competition on Innovation in Manufacturing Practices (IMP 2023) was held on June 26, 2023 at BIT Mesra dovetailed with NatFoE. Under the aegis of the **SERB-INAIE Woman Engineers Program** two workshops were conducted the first on **“Writing R&D Grant Proposal for Women Engineers”** at IIT Gandhinagar during February 23-24, 2023. The second event was the two-days Symposium for Young Women Engineers during November 20-21, 2023 at Tezpur University, Assam. The topic of the Symposium was **“Technologies for sustainable developments in North-Eastern Region”**. With a view to giving a fillip to the remote areas the events conducted under the **SERB-INAIE Outreach Programs for NE, J&K and Ladakh** were Workshop on **“Science and Technology Exhibition”** held in association with NIT Manipur during February 1-2, 2023; Two-Day SERB-INAIE Workshop on **“Entrepreneurship and Skill Development with Special Reference to Startups”** held on 17-18 July 2023 at University of Ladakh and Three-days’ workshop on **“Self-employment through Entrepreneurship – The path for Self-reliant India”** in association with NIT Silchar during July 26-28, 2023. The **INAIE Youth Conclave 2023** was held under the aegis of SERB-INAIE Innovation Hackathon was held during November 3-4, 2023 at GITAM University, Vishakhapatnam. All these events were outstanding successes with overwhelming participation and unprecedented enthusiasm. Each event was well appreciated by all the stakeholders from Academic

institutions, R&D Organization and Industry. The success of these initiatives shall lead to future programs of engineering importance to the nation producing unique impact and meaningful outcome. These programs were largely championed by Prof Sivaji Chakravorti, Vice President INAE.

- The **SERB-INAE Online and Digital Gaming Research Initiative** launched to leverage Digital Gaming Research and promote such Industry in India is progressing well. Forty-three proposals were received for execution shortly based on the merit of the proposal and guidelines thereof. Presentation Meetings were held on May 26-27, 2023. The experts committee, chaired by Prof PJ Narayanan, FNAE, Director IIIT Hyderabad, recommended deserving proposals for consideration of selection. Based on the recommendation, the Empowered Committee of SERB has approved thirteen proposals.
- INAE has also been very active on the international front. Joint collaborative activities are routinely held with foreign CAETS Member Academies. The **6th INAE-NAEK two-day workshop on “Perspective on Space Development”** was conducted on August 29 and 30, 2023. The workshop was conducted in hybrid mode with the Indian delegates assembling and joining online at New Delhi and the Korean delegates from Seoul, South Korea. Enthused by the success of the event, NAEK (Korea) has expressed keen interest to sustain this joint event annually with INAE anticipating meaningful outcome of interest to both countries.
- The International Council of Academies of Technological Sciences (CAETS) **2023** conference, with the working title "**e2-mobility. Solutions and Opportunities,**" was held in Zagreb in October 9-11, 2023, and brought together leading scientists, researchers and experts in the fields of mobility, electrification of transport, integration with energy systems, batteries, refuelling, autonomous driving and changes in mobility modalities. INAE delegation participated in the subject event. The **CAETS Engineering Education Working Group (EEWG)** has been created to help CAETS in contributing to continuous improvement and modernization of engineering education and practice internationally and promoting ethics in engineering education, research and practice. As the President INAE, I have been entrusted with the responsibility to Chair the Working Group along with Vice-Chair Dr Katherine Frase of USA-NAE at the behest of CAETS. Representatives from twenty-two member countries are the members of this Working Group.
- The **CAETS Communication Committee** was constituted with an objective of the Committee is to develop and maintain a CAETS Style Guide that sets content and style guidelines and defines templates for all CAETS Communications (statements, reports, videos, website, etc.). The committee also supports review of draft documents. Prof Amit Agrawal, IIT Bombay, FNAE is INAE representative at the CAETS Communication Committee. A meeting of the subject Committee was held on July 7, 2023 to provide feedback on CAETS Energy Committee report on e-mobility which is to be launched shortly. The fourth online meeting of the Committee was on December 7, 2023 to Design a communication plan template for the 2024 round of the communication prize – for discussion ahead of 2024 round.
- An Online Panel Discussion on **CAETS Energy Report 2022** entitled “**Towards Low-GHG Emissions from Energy Use in Selected Sectors**” was also held on 27th May 2023. Engagements with Royal Academy of Engineering, UK and INAE regarding Green Hydrogen Exchange were held online on November 9, 2023 to be culminated in a joint workshop at NCL, Pune in January 2024. The Program is being steered by Dr Ashish K Lele, FNAE, Director, CSIR-NCL on behalf of INAE.
- Inauguration of **INAE-IIT Jodhpur Joint Activity Centre at NCR Gurgaon** was done on November 14, 2023. The purpose of this center is to have a higher level of engagement

with Industries/PSUs/Ministries based out of the NCR area in the important initiatives of the Institute including but not limited to research, innovation, academics, etc.

- INAE, as you all are aware is in the process of working towards self-sustenance and financial autonomy in light of fact that the Department of Science and Technology (DST), as directed by the Department of Expenditure, Government of India (GoI) is in the process of disengaging itself from the activities of INAE including providing the annual financial support w.e.f. 31st March 2025. A series of actions have been taken by INAE since then to address the issue. Two Brain Storming Meetings were held at Bangalore on August 5, 2023 in physical mode to discuss the current challenges being faced by the Academy. The first Brainstorming Meet on **“INAE Mission, Vision and Objectives – An Assessment for Future Readiness”** was held in the forenoon at Indian Institute of Science, Bangalore organized jointly with INAE Bangalore Chapter, which was attended by about 30 Fellows. A follow-up Special Meeting of selected INAE Fellows on **“INAE’s roadmap for Financial and Functional Autonomy”** was also organized during the same evening Bangalore which was attended by about 20 Fellows. Meaningful suggestions and action -plans on the way forward emanated from the deliberations of both meetings. A meeting of INAE Delhi Chapter was organized to seek views, suggestions, and help to formulate a strategy for future sustenance on 21st September 2023 at office of Director IIT Delhi in physical mode. A similar meeting was also organized on 22nd September 2023 at IIT Bombay. A Brainstorming session hosted by Dr Manish Gupta, FNAE was also held on 7th December 2023 at the Google RMZ Infinity office, Bangalore.