ANRF (erstwhile SERB), - INAE Collaborative Initiatives in Engineering 2024-25

INAE jointly with SERB had taken a new initiative in the year 2022 to conduct various events under SERB-INAE Collaborative Initiative in Engineering. As an outcome, the following four initiatives under the umbrella of 'Collaborative Initiative in Engineering' were organized during this year.

A. SERB-INAE Conclaves on *Atmanirbhar* Technologies - Engineering Secured Future
B. SERB-INAE Woman Engineers Program
C. SERB-INAE Outreach Programs for NE, J&K and Ladakh
D. SERB-INAE Innovation Hackathon

INAE has received a tremendous response and the initiative has progressed well with the conduct the above listed events efficiently under all the four verticals. The events/programs organized during the period April 1, 2024 to March 31, 2025 are given below:

A. ANRF (SERB) - INAE Conclave on *Atmanirbhar* Technologies for Engineering a Secured Future

(i) Symposium on National Frontiers of Engineering and IMP at NIT Warangal

The 18th Symposium on National Frontiers of Engineering (NatFoE) was successfully hosted by the National Institute of Technology (NIT) Warangal in collaboration with the Indian National Academy of Engineering (INAE), under the auspices of the ANRF (SERB)–INAE Conclave on *Atmanirbhar* Technologies for Engineering a Secured Future, held on November 15-16, 2024.

The 18th Symposium on National Frontiers of Engineering (NatFoE), a flagship event organized by the Indian National Academy of Engineering (INAE) since 2006, aims to inspire young engineers (aged approximately 27-45) from industries, universities, and R&D labs to present cutting-edge research in various engineering fields. The 2024 edition saw enthusiastic participation from a large number of young researchers representing academic institutions, research laboratories, and industrial organizations.

The inaugural session, held at the Ambedkar Learning Centre, NIT Warangal, was graced by eminent dignitaries including Prof. Indranil Manna, President, INAE; Prof. Sivaji Chakravorti, Vice President, INAE; Prof. Bidyadhar Subudhi, Director, NIT Warangal; and Prof. Shirish H. Sonawane, Dean (Research and Development), NIT Warangal.

In alignment with the nation's mission on Atmanirbhar Technologies, the symposium was structured around four carefully selected thematic areas, reflecting emerging priorities in engineering and technology. The themes were as follows:

- Additive Manufacturing and Automation
- Smart Grid: Power Electronic Converters, Control, and Protection
- Green Hydrogen and Storage Technologies
- Quantum Computing, Artificial Intelligence, and Machine Learning

Based on these themes, the symposium featured four focused technical sessions, each dedicated to in-depth discussions and presentations by young researchers and professionals at the forefront of these cutting-edge domains.

Session 1: Additive Manufacturing and Automation

a. Human-Centric Manufacturing and Industry 5.0

Prof. S. K. Pal from IIT Kharagpur emphasized the transformative potential of Artificial Intelligence (AI) and automation in the manufacturing sector, particularly within the context of Industry 5.0. Unlike Industry 4.0, which focuses primarily on digitization and automation, Industry 5.0 adopts a human-centric approach, promoting meaningful collaboration between humans and intelligent machines. Prof. Pal underscored that this paradigm shift ensures human creativity, problem-solving abilities, and emotional intelligence remain integral to innovation and decision-making in future manufacturing ecosystems.

AI and automation optimize manufacturing by improving efficiency, enhancing quality, reducing costs, and driving innovation. AI handles repetitive tasks, allowing humans to focus on more complex, creative work. However, the human element remains crucial for addressing challenges that require emotional intelligence and judgment. Prof. Pal also stressed the importance of sustainability in manufacturing, advocating for the integration of green technologies, alternative energy, and scalable automation. This approach can help small-scale industries reduce costs, enhance energy efficiency, and contribute to a greener future.

Cybersecurity risks related to AI and automation were another concern. As industries become more interconnected, robust cybersecurity measures are essential to protect data and operational safety. Looking to the future, Prof. Pal discussed the potential of 6G networks and the Internet of Things (IoT) in enabling real-time communication and self-optimizing factories. Tactile IoT systems will enhance precision and safety, making manufacturing smarter, more efficient, and safer.

b. Additive Manufacturing by Laser Powder Bed Fusion

Dr. Gururaj T, Scientist at ARCI, shared significant advancements in material development for Additive Manufacturing (AM) using Laser Powder Bed Fusion (L-PBF) technology. He emphasized the critical role of alloy chemistry modification in optimizing material properties for high-performance 3D printing. The use of spherical powders was highlighted for their improved flowability and consistency, which contribute to enhanced print quality and reduced defect rates.

Dr. Gururaj also discussed the integration of conformal cooling channels in AM, which significantly improve heat dissipation and extend the service life of manufacturing dies. He further underlined the advantages of topology optimization in designing lightweight structures that maintain structural integrity while minimizing material usage.

Looking ahead, Dr. Gururaj outlined ongoing research into the development of new alloy powders, including those based on non-weldable materials, as well as the transformative potential of Artificial Intelligence (AI) and Machine Learning (ML) in enabling real-time optimization of AM process parameters. These technologies are poised to significantly enhance precision, repeatability, and efficiency in additive manufacturing.

He also stressed the importance of refining powder characteristics, particularly by improving powder sphericity and eliminating satellite particles, to ensure consistent and reliable printing outcomes. In conclusion, Dr. Gururaj's presentation highlighted a promising future for Additive Manufacturing—driven by innovations in materials, AI-enabled process control, and enhanced powder quality—offering immense benefits to sectors such as aerospace, automotive, and healthcare.

c. Qualification and Standards in Additive Manufacturing (AM), especially for aerospace and aviation applications

Mr. Ankit Sahu, from Objectify Technologies Pvt. Ltd., underscored the critical importance of process and material qualification in metal Additive Manufacturing (AM), particularly for high-stakes sectors such as aerospace and aviation. He elaborated on strategic approaches to design planning, ensuring regulatory compliance, and adherence to industry standards such as AWS D20, with a strong focus on dimensional tolerances, acceptance criteria, and Non-Destructive Testing (NDT) qualifications.

Mr. Sahu highlighted the value of integrating online defect monitoring during the Laser Powder Bed Fusion (L-PBF) deposition process, along with comprehensive process validation, to uphold manufacturing reliability and ensure high-quality output.

Looking ahead, he outlined future initiatives aimed at strengthening regulatory frameworks, enhancing defect detection techniques, and refining manufacturing practices—all directed toward enabling the production of advanced, reliable components for applications such as aerospace systems and unmanned aerial vehicles (UAVs).

d. 3D Printing for Energy Devices

Prof. Poonam Sundriyal, IIT Kharagpur presented groundbreaking research on the use of 3D printing technology for developing flexible, wearable supercapacitors integrated with energy-harvesting components. These advanced supercapacitors are engineered to efficiently store and deliver energy while maintaining mechanical resilience, making them ideally suited for wearable electronics. The incorporation of energy-harvesting modules enables the devices to draw power from external stimuli such as motion or environmental conditions, offering a sustainable and self-sufficient energy solution.

Prof. Sundriyal highlighted the impressive performance of these devices under real-world conditions, where flexibility and durability are essential—particularly in applications involving continuous wear and movement. Looking ahead, she emphasized the need to further advance the technology behind cell-powered electronics. Enhancing energy-harvesting capabilities and improving the durability of these supercapacitors will be key to ensuring reliable performance under ongoing mechanical stress. Such innovations are vital for the future of practical, sustainable, and energy-efficient solutions, with potential applications ranging from wearable health monitoring systems to flexible consumer electronics and beyond.

Prof. Sundriyal's research not only pushes the frontier of energy storage technology, but also contributes meaningfully to the development of environmentally friendly, self-powered devices designed to meet the rising demand for efficient and sustainable electronic systems across industries.

Session 2: Smart Grid: Power Electronic Converters, Control and Protection

The plenary session under Theme 2: Smart Grid – Power Electronic Converters, Control, and Protection was delivered by Prof. S. C. Srivastava, a distinguished expert from IIT Kanpur and a pioneer in power system innovations. Prof. Srivastava offered a comprehensive overview of the evolution of smart electric grids, with a particular focus on microgrid systems and advanced technologies for power management.

Drawing from his experience with the microgrid developed at IIT Kanpur, he provided an insightful real-time case study on the challenges and solutions involved in renewable energy–integrated microgrid operations. His session also delved into the net-zero emissions paradigm, outlining the strides being made in this critical area of energy research. Prof. Srivastava emphasized that the successful deployment of smart grids with deep renewable energy integration is pivotal in addressing the ever-increasing electricity demands of the future.

Invited Talks by Emerging Researchers

As part of the thematic focus on smart grids, three invited lectures were delivered by promising young faculty members from leading institutions:

- Dr. Yashasvi Bansal, Assistant Professor, IIT Delhi, spoke on "The Transformative Role of PMUs for Monitoring and Protection in Smart Grids." She highlighted the importance of Phasor Measurement Units (PMUs) in enhancing real-time monitoring, protection, and control of smart grids, emphasizing their role in ensuring grid reliability and stability.
- Dr. P. Deepak Reddy, Assistant Professor, IIT Kharagpur, presented his work on "Operation and Control of Microgrid Systems." He discussed various operational modes and control strategies for efficient integration of renewable energy sources, showcasing how microgrids can enhance grid flexibility and resilience.
- Dr. Chandrashekhar Perumalla, IIT Bhubaneswar, provided an in-depth exploration of wireless power transfer and its applications in electric vehicle (EV) charging. He emphasized the need for developing a robust EV charging infrastructure to support India's net-zero emission goals, highlighting the transformative potential of innovative charging technologies in creating a sustainable transportation ecosystem.

Key Takeaways:

- Integration of Renewables: Transitioning to smart grids powered by renewable energy is essential for sustainability, necessitating innovative management approaches and advanced technologies.
- Real-Time Monitoring: Devices such as PMUs are indispensable for maintaining grid stability in dynamic, complex power systems.
- Microgrid Flexibility: Modular and adaptive microgrids offer scalable solutions but require sophisticated control mechanisms for effective deployment.
- Investment in EV Infrastructure: Expanding EV charging networks, including wireless solutions, is critical for sustainable mobility and achieving net-zero targets.

These sessions collectively highlighted that the future of smart grids lies in the convergence of technological innovation, renewable energy integration, infrastructure development, and strategic administration, all of which are vital to meeting the country's environmental and energy security goals.

Session 3: Green Hydrogen and Storage Technologies

The second day of the National Frontiers of Engineering Symposium (NatFoE) 2024 commenced with an intellectually stimulating session dedicated to Green Hydrogen and Storage Technologies. The session conveners extended a warm welcome to the esteemed speakers, distinguished guests, enthusiastic

participants, and students, setting an inspiring tone for an important discourse at the confluence of innovation, sustainability, and national development.

In the context of global efforts to combat climate change and ensure energy security, green hydrogen has emerged as a pivotal clean energy vector. Its versatility and zero-emission potential position it as a transformative solution across sectors such as industry, transportation, and power generation. Complementarily, advancements in energy storage technologies are crucial to realizing the full promise of renewable energy by enhancing grid stability, reliability, and scalability. Together, green hydrogen and storage solutions form the cornerstone of a sustainable and resilient energy future—both for India and the world.

The session opened with a plenary lecture by Prof. S. Basu of IIT Delhi, a distinguished authority in electrochemical systems. His keynote address, "Electrochemical Engines for Energy Storage and Conversion to Achieve Net Zero Carbon Emission," offered a comprehensive examination of hydrogen's role as a transformative energy carrier. Prof. Basu underscored the technological advancements required to render hydrogen and fuel cell technologies both environmentally sustainable and commercially feasible. Notably, he presented promising research on a membrane-less alkaline micro-electrolyser, an innovation poised to enhance the efficiency and economic viability of hydrogen production.

This foundational lecture was followed by three invited talks, each contributing unique perspectives and cutting-edge developments:

- Dr. Vijay Radhakrishnan from Reliance India Limited, Mumbai, delivered an enlightening lecture on Sodium-ion Batteries as a sustainable and scalable alternative to conventional lithium-ion technologies. He addressed key engineering challenges and elaborated on strategic pathways for their commercialization, underlining the technology's potential to support India's energy transition.

- Dr. Sujit Pillai from the Ministry of New and Renewable Energy (MNRE) provided critical policy insights through his talk on the Indian National Green Hydrogen Mission. He detailed government initiatives and technological progress in electrolyzers, including PEM, AEM, SOEC, and alkaline variants, mapping a comprehensive trajectory for the large-scale adoption of green hydrogen in India.

- Dr. Sreedevi Varam from NIT Warangal presented pioneering research on on-demand hydrogen generation using innovative aluminum-based composite materials. Her talk emphasized aluminum's high energy density and explored the role of metal activators and additives in addressing challenges associated with hydrogen storage and transportation. Her findings highlighted the material's significant promise for clean and efficient hydrogen energy systems.

Each lecture was followed by dynamic audience engagement, with thoughtful questions and constructive discussions that further enriched the collaborative atmosphere of the session. The exchange of ideas fostered a spirit of innovation and collective ambition, aligning with the nation's broader vision for a net-zero future. The session concluded with sincere gratitude to the Indian National Academy of Engineering (INAE) and ANRF for providing this esteemed platform, enabling thought leaders and young researchers to converge, collaborate, and contribute meaningfully to the advancement of sustainable energy technologies.

Session 4: Quantum Computing and AI ML

Five talks on state-of-the-art technologies were organized as a part of second day of NaTFoE 2024. The main frontiers of each talk are listed below:

- Quantum Technologies in the National Quantum Mission: The National Quantum Mission (NQM) has created four technology verticals in quantum computing, communication, sensing and metrology, and materials and devices. These four verticals aim to translate quantum science into applicable technologies that benefit Indian industry and society. The main challenges discussed were Scaling Quantum Systems, efficient Quantum Algorithms, Quantum Materials and Hardware, Quantum Networking and Communication, Error Mitigation and Noise Management, and Standardization and Accessibility.

- Importance of Remote Photoplethysmography in AI: Remote photoplethysmography (rPPG) is a contactless technology that estimates physiological parameters such as heart rate, respiratory rate, and blood oxygen saturation using video-based analysis. Coupled with AI, rPPG has become a transformative tool across various domains, emphasizing its significance in modern healthcare, wellness, and beyond. The critical points discussed are AI integration with contactless health monitoring, development of AI algorithms for robust signal interpretation, leveraging federated learning for privacy-preserving data analysis, and Integration of rPPG into interoperable AI-powered health systems.

- Quantum Simulators and Accelerators: Harnessing PARAM for Quantum Computing Acceleration: Quantum simulators and accelerators are crucial in advancing quantum computing, offering the capability to model quantum systems and execute quantum algorithms faster. PARAM, India's Indigenous supercomputing series, plays a vital role in fostering the development of quantum computing acceleration. By integrating quantum simulators and accelerators into its architecture, PARAM can lead India's efforts in quantum research, supporting applications in science, engineering, and beyond. This synergy positions PARAM as a cornerstone in the quantum computing revolution.

- Symbiotic Relationship Between Artificial Intelligence and Computing Systems Design: There is a symbiotic relationship between artificial intelligence, primarily machine learning and deep learning, and computing systems design, emphasizing how they have come to influence the progress of each other. Traditionally, we believe in providing more computing power to the ever-increasing complex ML/DL models. The symbiotic relationship between AI and computing systems design reshapes the technological landscape. This interplay drives innovation in AI applications and enhances computing platforms, paving the way for more intelligent, efficient, and sustainable systems. By harnessing this synergy, industries can address emerging challenges in energy, scalability, and real-world AI deployment.

- AI Infrastructure: Optimizing LLM Inference for Efficiency and Scalability: Large Language Models (LLMs) are revolutionizing AI applications with their unprecedented language understanding and generation capabilities. However, training and deploying these models at scale can be computationally expensive and resource-intensive. To unlock the full potential of LLMs, it is crucial to optimize their inference process. Optimizing LLM inference for efficiency and scalability is at the frontier of AI infrastructure development. Through innovations in model compression, hardware acceleration, memory optimization, and scalable frameworks, the field is moving toward sustainable, real-time, and accessible LLM deployment.

These advancements enable broader adoption of LLMs and ensure their role in shaping transformative applications across industries.

Around 70 faculty and researchers from various engineering institutions participated in the two-day program. 28 posters were presented during the event and in addition a National Level Competition, Innovations in manufacturing practices was dovetailed with the 18th National Frontiers of Engineering (NatFoE-24) Symposium on the second day where students across India presented their innovative ideas.

Inauguration of NaTFoE at NIT Warangal by Prof Sivaji Chakravorti, Vice President INAE

Group Photo of participants of NaTFoE 2024

Presidential address by Prof Indranil Manna, President INAE

Release of NatFoE Souvenir during Inaugural as part of the Inaugural Function

<u>Innovation in Manufacturing Practices (IMP)</u>

The Innovation in Manufacturing Processes (IMP) – 2024, organized by INAE in collaboration with the National Institute of Technology Warangal under the aegis of the ANRF (SERB) - INAE Conclave on *Atmanirbhar* Technologies- Engineering Secured Future, took place on November 16, 2024. This event brought together a diverse group of participants, including undergraduate and postgraduate (Master's students) as well as start-ups, all presenting innovative ideas and projects related to advancements in the manufacturing sector.

A total of 24 teams participated, pitching their cutting-edge ideas and demonstrating how they could revolutionize manufacturing processes. The event highlighted a broad spectrum of topics, from new manufacturing techniques to sustainability innovations, all aimed at driving progress within the industry.

At the conclusion of the event, cash awards were presented by eminent guests in three distinct categories, recognizing the most outstanding projects. In addition, certificates were distributed to the best poster presentations across four themes, further encouraging participants to engage in deep research and

innovative thinking. The event not only provided valuable exposure to the participants but also fostered collaborations, ideas exchange, and inspiration, contributing to the larger goal of fostering an Atmanirbhar (self-reliant) manufacturing ecosystem in India.

Highlights:

- Over 28 posters were presented at the symposium, each reviewed by Prof. Sivaji Chakravorti, Prof. Subudhi, and an evaluation committee for each theme. Best poster certificates were awarded to the top presentations.
- The event featured 18 plenary and keynote talks, with a focus on diversity in the topics covered.
- A total of 67 participants from across the country attended the two-day symposium, with *64* participants from IMP presenting their ideas.
- 24 innovative ideas were pitched in the IMP session, out of the 67 submitted.
- Prof. Indranil Manna and Prof. Sivaji Chakravorti engaged with the IMP participants, offering valuable insights and feedback while also reviewing the prototypes.
- An MoU was signed between NIT Warangal and Agastya Hydrogen, marking a significant step in advancing collaboration in hydrogen technologies.

Participants, especially students, expressed that the symposium provided an excellent learning opportunity. They were highly motivated and inspired by the posters and exhibits showcased during IMP, which fuelled their enthusiasm for innovation and research in the manufacturing sector.

Prize Distribution to the winner of Innovation in Manufacturing Practices (IMP) 2024 by INAE leadership

Prize Distribution to the winner of Innovation in Manufacturing Practices (IMP) 2024 by INAE leadership

Memento presented to Prof Indranil Manna, President INAE by Prof Bidyadhar Subudhi, Director NIT Warangal

Memento presented to Prof Sivaji Chakravorti, Vice-President INAE by Prof Bidyadhar Subudhi, Director NIT Warangal

(ii) Poster Session organized under the aegis of "SERB (ANRF)-INAE Conclaves on Atmanirbhar Technologies - Engineering Secured Future" at IIT Delhi

A Poster Session and competition was held under the aegis of "SERB (ANRF)-INAE Conclaves on *Atmanirbhar* Technologies - Engineering Secured Future" for Masters' Students and PhD Scholars of IIT Delhi on Dec 19-20, 2024 on the sidelines of the INAE Annual Convention 2024. This was a golden opportunity for them to showcase their research contributions in ten broad engineering disciplines. The Posters were judged by a panel of expert jury members from INAE Fellowship and Faculty of IIT Delhi who also interacted with the students and asked pertinent questions. The prize distribution of the Poster Session and competition, was held on December 20, 2024. The students appreciated the Poster Competition and also appreciated the lectures on both days and gained insightful knowledge through the conduct of the Poster Session and participation in the convention.

Prof SM Ishtiaque Judging the Posters

Judging by Prof Mahesh Tandon, FNAE & Mr VN Heggade, FNAE

Prof Sushmita Mitra, FNAE & Dr Lipika Dey, Judging Posters

Prof Maithili Sharan, FNAE in Judging Process

Pictorial Delight of Prize Distribution for Poster Session

Prof Sivaji Chakravorti, Vice-President, INAE (Extreme left) and Prof. Naresh Bhatnagar, FNAE, Dean (R & D), IIT Delhi (Extreme Right) presenting Prizes to the Winners of the Poster Session.

(iii) Conclave on "*Atmanirbhar* Technologies: Engineering a Secure Future" at IIT Dharwad

The Indian Institute of Technology Dharwad (IITDh) successfully organized a one-day national conclave titled "*Atmanirbhar* Technologies: Engineering a Secure Future" on March 21, 2025. This prestigious event was conducted under the aegis of ANRF (SERB) – INAE Conclave on *Atmanirbhar* Technologies: Engineering a Secure Future. It served as a significant initiative in alignment with the national visions of Atmanirbhar Bharat and *Viksit Bharat*, aimed at fortifying the country's self-reliance in indigenous technology and engineering for a secure and sustainable future.

The conclave brought together a dynamic mix of participants from academia, research institutions, and industry. It served as a platform to foster dialogue, promote collaborative research, and showcase technological innovation across a range of critical sectors. The agenda was meticulously designed to bridge the gap between academic research and industrial application, thereby reinforcing the national objective of technological sovereignty.

The day commenced at 9:30 a.m. with an inaugural ceremony, marked by the traditional lighting of the lamp, symbolizing the illumination of knowledge and innovation. Eminent guests included Dr. Anushree Ramanath, Schneider Electric, USA; Mr Mahalingam Koushik, Founder, Chara Technologies, Bangalore; Dr. Ravi Guttal, CTO, Aequs Pvt. Ltd.; Dr. Karthik Sankaran, Bangalore-based entrepreneur and semiconductor expert; and Mr Ram Subramaniam, Hubli-based entrepreneur working in the strategic sectors of the economy. They were joined by senior faculty members of IIT Dharwad including Prof. Somashekara M A (Head of the MMAE Department), Prof. Dileep A D (Dean of Administration and officiating Director of the Institute), Prof. Dhiraj V Patil (Dean of Faculty Welfare), Prof. Ramjee Repaka (Dean of Student Welfare), and Prof. Pratyasa Bhui (Dean of Research and Development).

The inaugural address was delivered by Prof. Amar Gaonkar, Associate Professor at IIT Dharwad, who emphasized the importance of nurturing indigenous engineering solutions and the critical role academic institutions play in this transformation. Following this, Prof. Dileep A D, serving as the officiating Director, presented the keynote address. He spoke on the importance of collaborative research and innovation, stressing the need for partnerships across academia, industry, and government sectors to realize the goals of a self-reliant India.

The conclave focused on four core thematic areas, each chosen for their relevance to India's strategic technological roadmap: Circular Manufacturing, Secure and Sustainable Electric Power, Indigenous Technology for Strategic Sectors, and Electronics, Semiconductors, and Chip Manufacturing. These themes formed the backbone of the technical sessions and discussions that unfolded throughout the day.

Lamp Lighting Ceremony

The morning session featured a series of thought-provoking technical talks. The first talk of the day, delivered by Dr. Anushree Ramanath, was titled “AI for Renewables: Enabling Smart, Scalable, and Sustainable Energy Solutions”. In her address, Dr. Ramanath discussed the transformative potential of artificial intelligence in the renewable energy landscape. Drawing from her international experience, she provided deep insights into how smart systems and predictive analytics are revolutionizing energy generation and management. Her talk inspired young researchers to adopt AI-driven approaches to address real-world challenges in energy sustainability.

Following this, Mr Ram Subramaniam presented a compelling session on “Indigenous Technology Development for Strategic Sectors in the Indian Economy”. His talk underscored the pressing need for innovation-led self-reliance in areas such as defense, energy, and critical infrastructure. The morning session culminated in a panel discussion, moderated by Prof. Abhijit Kshirsagar. This interactive session brought together experts from academia and industry to deliberate on key challenges, emerging trends, and future prospects in the development of self-reliant technologies. Topics such as artificial intelligence in education, sustainable industrial practices, and reforms in technology-enhanced learning were explored in depth.

All the Attendees gathered at the Event Hall

The conclave then transitioned into a lunch and poster presentation session where the students and researchers showcased their innovations and ongoing projects through detailed poster presentations. The exhibits reflected creativity, technical rigor, and a deep commitment to solving national challenges using indigenous resources and solutions. The afternoon session featured three more technical talks. The first, delivered by Dr. Ravi Guttal, was titled “Reliable Manufacturing Ecosystems”. In his session, Dr. Guttal outlined the systemic requirements and challenges associated with building dependable and scalable manufacturing frameworks within India. Drawing on his industrial experience, he provided actionable insights into supply chain dynamics, quality assurance, and process innovation.

This was followed by a session by Dr. Karthik Sankaran on “Electronics, Semiconductors, and Chip Manufacturing in India”. As a technologist and entrepreneur, Dr. Sankaran presented an in-depth overview of India’s position in the global semiconductor landscape. He addressed current capabilities, strategic gaps, and the immense potential for India to emerge as a global hub for semiconductor design and manufacturing.

The final technical talk of the day was presented by Mr Mahalingam Koushik. His talk, titled “Rare-earth Free Solutions: Machines and Drives for Sustainable Transportation and Industrial Applications”, focused on innovations in electric motor design that reduce dependency on rare-earth elements. His discussion highlighted the role of deep-tech startups in fostering environmentally sustainable industrial applications, paving the way for more self-reliant and ecologically conscious engineering.

The event concluded with a valedictory function in the presence of the organizing team, faculty members, and guest speakers. Prof. Somashekara M A felicitated all invited speakers with mementos as a token of appreciation. Awards were also announced for the best student poster presentations, acknowledging the creativity and effort put forth by the student researchers. The vote of thanks was delivered by Prof. Amar Gaonkar, who expressed his gratitude to the speakers, participants, sponsors, and organizing volunteers for their enthusiastic participation and valuable contributions.

The conclave on "*Atmanirbhar* Technologies: Engineering a Secure Future" proved to be a milestone event that not only provided a platform for knowledge sharing and collaboration but also reaffirmed the vital role of technology and innovation in building a secure, self-reliant India. It was a day marked by insightful discussions, inspiring presentations, and a shared commitment to national progress through indigenous technological development.

First Technical Talk by Dr. Anushree Ramanath

Second Technical Talk by Mr M Ram Subramaniam

Prof. Abhijit Kshirsagar moderating the Panel Discussion

Dr. Ravi Guttal delivering the Technical Talk

(iv) Conclave on ANRF(SERB)-INAE Conclaves on *Atmanirbhar* Technologies - Engineering Secured Future at NAIMT Ranchi

The ANRF (SERB) – INAE Conclave 2025 on *Atmanirbhar* Technologies – Engineering Secure Future was organized with great fervour at the National Institute of Advanced Manufacturing Technology (NIAMT), Ranchi during March 22-23, 2025 bringing together thought leaders, researchers, policymakers, academicians, and innovators from across the country. The two-day conclave focused on the vision of a self-reliant India through engineering innovation, technological growth, and strategic collaboration.

The conclave commenced with an inspiring inauguration ceremony, graced by distinguished dignitaries and a gathering of over 120 participants from various academic, research, and industrial domains. The event was formally inaugurated by Professor G. Satheesh Reddy, President of the Aeronautical Society of India and Distinguished Senior Professor at BITS Pilani. His presence as the Chief Guest added immense value to the occasion.

The Guests of Honor included Mr Rajesh Singh, Joint Secretary and Financial Adviser, Ministry of Electronics and Information Technology, Government of India, and Professor Sumit Kumar Ray, Professor at IIT Kharagpur. The ceremony was presided over by Mr Arun Kumar Jha, Chancellor of NIAMT. The event began with a warm welcome address delivered by Professor Partha Protim Chattopadhyay, Director of NIAMT Ranchi. He expressed his gratitude to the dignitaries and participants for their presence and emphasized the relevance of the conclave in today's rapidly evolving technological landscape.

In his keynote address, Professor G. Satheesh Reddy shed light on the importance of Atmanirbhar Bharat (Self-Reliant India), aligning it with the broader national vision of *Viksit Bharat* 2047. He urged the audience, especially the youth and innovators, to channel their expertise and energy towards indigenous technological advancements that would strengthen the country's strategic autonomy. Following this, Mr Arun Kumar Jha spoke passionately about entrepreneurship as a viable and essential career path for students. He noted with concern the relatively low contribution of the manufacturing sector to India's GDP compared to other leading economies and encouraged academic institutions like NIAMT to play a transformative role in addressing this gap.

Mr Rajesh Singh delivered an insightful talk on the rapid pace of innovation and the burgeoning startup ecosystem in India. He emphasized the need for supportive policies and institutional collaboration to sustain this growth. Professor Sumit Kumar Ray contributed to the discussions by speaking on two key national missions—Semiconductors and Clean Energy. His talk underscored the vital need for research-driven solutions in these sectors to ensure energy security and technological independence.

The inaugural session concluded with a formal vote of thanks proposed by Professor Debdas Roy, Convener of the conclave, who acknowledged the contributions of the guests and expressed optimism about the deliberations to follow in the subsequent sessions.

The second day of the conclave culminated in a grand prize distribution ceremony. The occasion was honored by the presence of Mr Sanjay Seth, Hon'ble Minister of State for Defense, Government of India, who served as the Chief Guest. His presence marked a significant moment for the institution and the participants.

The Guest of Honor for the ceremony was Ms. Mohua Dutta, Director of MDS IndoCan Inc., Canada. The event was further enriched by the presence of several notable figures, including Mr Arun Kumar Jha, Chancellor of NIAMT, Professor Goutam Sutradhar, Director of NIT Jamshedpur, Dr. Suvrokamal Dutta, an international conservative political-economic and foreign policy expert, and Professor Sukumar Mishra, Director of IIT(ISM) Dhanbad.

The ceremony began with a welcome address by Professor Partha Protim Chattopadhyay, Director of NIAMT, who set the tone for the event by highlighting the institute's ongoing efforts in fostering innovation and self-reliance.

Professor Sukumar Mishra delivered a thought-provoking speech on the concepts of Technovate and Atmanirbhar. He encouraged the young generation to go beyond academic excellence and work towards

converting knowledge and scientific research into viable engineering solutions that can drive India's journey toward self-reliance.

Following this, Dr. Suvrokamal Dutta presented a compelling vision of India's future as a global economic power. He outlined five core pillars essential for the realization of *Viksit Bharat*: Yuva (Youth), Nari Shakti (Women Empowerment), Gyan (Knowledge), Industry, and the combined strength of Kisan and Mazdoor (Farmers and Workers). His address provided both inspiration and direction for the gathered audience.

Professor Goutam Sutradhar emphasized the crucial role played by engineers, professors, and researchers in nation-building. He called for a united effort towards achieving independence in key sectors such as semiconductors and manufacturing, underlining the importance of academic-industry-government collaboration.

Ms. Mohua Dutta's address was particularly noteworthy for highlighting the collaborative potential between India and Canada. She shared insights into international partnerships and announced the signing of a Memorandum of Understanding (MoU) between MDS IndoCan Inc. and NIAMT to pursue joint futuristic innovation projects.

Mr Arun Kumar Jha once again reiterated NIAMT's critical role in furthering the vision of Atmanirbhar Bharat, stressing the importance of academic institutions acting as catalysts in the transformation of the Indian economy.

The highlight of the event was the rousing speech by Mr Sanjay Seth, Hon'ble Minister of State for Defense. His words resonated deeply with the gathering as he spoke of the government's progressive policies and developmental efforts aimed at strengthening India's global standing. He urged students to cultivate a sense of patriotism and commitment towards building a strong, self-reliant nation. As part of the ceremony, he also conducted the Bhoomi Pooja (groundbreaking ceremony) for the upcoming Central Workshop Facility at NIAMT, marking a significant milestone in the institute's infrastructure development.

The prize distribution ceremony celebrated the winners of various competitions organized during the conclave, including Innovative Product Prototypes, Grand Ideas Challenge, and Start-up Ideation. Awardees received mementos and cash prizes in recognition of their creativity and technological ingenuity. The event concluded with a heartfelt vote of thanks by Dr. Vaishali S. Poddar, who acknowledged the support and contributions of all dignitaries, participants, organizing team members, and collaborators.

The ANRF (SERB) – INAE Conclave 2025 successfully served as a platform to deliberate, ideate, and celebrate technological self-reliance. It reinforced the critical role of academic institutions in national development and fostered a spirit of innovation, entrepreneurship, and patriotic dedication among the future torchbearers of the nation.

Faculty members, dignitaries and participants gracing the event

Lighting of auspicious lamp by distinguished dignitaries on the dais during the Inauguration ceremony

B. SERB-INAE Woman Engineers Program

(i) Workshop on Women Leaders in a Tech-Driven World: A Transformative Workshop at MNIT Jaipur

In an era where technology is rapidly reshaping industries, empowering women in the tech sector is crucial for fostering innovation and inclusivity. Recognizing this need, Malaviya National Institute of Technology (MNIT) Jaipur organized a two-day workshop titled "Women Leaders in a Tech-Driven World" under the aegis of SERB-INAE Woman Engineers Program on February 7-8, 2025. The event brought together leading academicians, entrepreneurs, researchers, and professionals to discuss challenges, share insights, and inspire the next generation of women in technology.

The workshop aimed to identify the roadblocks at every stage of the professional career of women technologists, more so as they rise the ladder towards the top. Eventually, this aims to chalk out pathways for women professional towards the echelons of the technology world, so that they can have their fair share of recognition and growth.

The workshop was a pioneering initiative with an aim to inspire, empower, and connect women in technology and research fields. This two-day workshop provided a platform for women faculty, students, researchers, and professionals to explore current trends in technology, engage in thought-provoking discussions, and gain insights from industry and academic leaders to lead the developing Tech-powered India. The event also included state-of-the-art keynote lectures, interactive panel discussions, and activity-based sessions that focus on fostering leadership, promoting gender equality, and enhancing skills to thrive in the tech industry.

Targeted Audience:

- Female students from engineering, computer science, and other technology spectrums.
- Early-career researchers and academicians interested in technology and innovation.
- Professionals from the tech industry focused on research and development, innovation, and gender diversity.
- Faculty members and policymakers interested in gender inclusion.

The workshop began with a dignified inaugural ceremony, where the traditional lamp-lighting was led by the Director of MNIT Jaipur and the Chief Guest, Dr. Chandrika Kaushik, Director General (PC & SI), DRDO. Other esteemed guests included Mrs. Prabha Goyal, Executive Director, Bharat Electronics Ltd., and Mr. Rohit Bhakar, Registrar of MNIT Jaipur. Under the leadership of Dr. Swati Sharma, Metallurgy Department, MNIT Jaipur, the event was carefully structured to ensure meaningful conversations and valuable takeaways.

Dignitaries on the dais

The first day of the workshop focused on leadership, innovation, and entrepreneurship in the tech industry. Dr. Chandrika Kaushik, Director General (Production Coordination & Services Interaction (PC & SI), DRDO in her keynote lecture titled "Trailblazers of Technology: Women Leaders Shaping the Future,"

highlighted the transformative role women play in technology and emphasized the importance of fostering leadership and resilience among aspiring female technologists. A panel discussion explored the evolving landscape of women in technology, addressing key industry trends, challenges, and the need for a more supportive ecosystem.

The discussions on the first day also addressed critical issues, with Dr. Vibha Tripathi leading a session on overcoming barriers faced by women in technology, including gender bias, lack of mentorship, and work-life balance challenges. Another dynamic panel featuring Dr. Vibha Tripathi, Founder, Boon, Ms. Anushree Srivastava, Director Grey Matterz, Managing Partner GOFI and Prof. D. Boolchandani, ECE Department, MNIT Jaipur explored how women entrepreneurs can leverage innovation to launch and sustain successful tech ventures. The day concluded with an insightful session on soft skills development by Prof. Sivaji Chakravorti, Vice President, INAE who underscored the significance of communication, leadership, and teamwork in advancing women's careers.

Participants attending session during the workshop

The second day of the workshop shifted focus to holistic growth, mental well-being, and strategies for encouraging young women to pursue STEM careers. Dr. Aarti Chitkaria Chopra and Dr. Nidhi Bansal led a crucial discussion on stress management, burnout prevention, and maintaining a healthy work-life balance, acknowledging the pressures women often face in the fast-paced tech industry. This was followed by an engaging panel discussion on fostering diversity, equity, and inclusion in the workplace. Speakers including Prof. Hemlata Manglani, Dr. Aarti Chitkaria Chopra, Associate Professor, Poornima University; Dr. Swati Soni, Professor, Jaipuria Institute of Management; Prof. Rohit Bhakar, Professor, MNIT Jaipur emphasized the importance of workplace policies that actively support gender inclusivity.

A particularly impactful session focused on encouraging young girls from rural backgrounds to explore STEM careers. Experts Ms. Pallavi Tak, Vice President, Seed & Acceleration; Prof. Lava Bhargava, ECE Department, MNIT Jaipur; Ms. Alka Singh, Head of Policy and Strategic Partnerships; and Dr. Vartika Arora, Principal, Kanoria School of Law for Women, Jaipur shared insights on bridging the urban-rural divide in STEM education, addressing societal and infrastructural challenges that often deter young girls from pursuing opportunities in science and technology.

The workshop concluded with a valedictory session led by Dr. Shweta Sharma, MNIT Jaipur where certificates were distributed and closing remarks were shared. The event ended on a high note, leaving participants feeling empowered, inspired, and motivated to break barriers in the tech industry. The "Women Leaders in a Tech-Driven World" workshop at MNIT Jaipur was more than just an event—it was a step toward meaningful change. By fostering dialogue, mentorship, and collaboration, it encouraged women to embrace leadership roles, drive innovation, and contribute to a more inclusive technological

future. Initiatives like these continue to pave the way for greater representation of women in STEM, ensuring that diversity remains a driving force behind technological progress.

To summarize, the workshop provided numerous benefits, both immediate and long-term, to its participants and the broader community.

Empowerment and Inspiration: Keynote lectures by accomplished leaders like Ms. Prabha Goyal, Dr. Vibha Tripathi, and Ms. Anushree provided real-world success stories and inspiration.

Networking Opportunities: Enabled connections with peers, mentors, and professionals from academia, industry, and entrepreneurship, fostering collaborations and mentorship opportunities.

Skill Development: Panel discussions on themes like entrepreneurship, innovation, mental health, and leadership offered practical tips and strategies for career advancement in STEM.

Awareness of Trends: Insights into current technological advancements and challenges for women in tech professions helped participants align their careers with future industry demands.

Mental Health Focus: Discussion on mental health and wellbeing addressed the unique pressures faced by women in STEM, encouraging resilience and balance. Session by Dr. Aarti Chitkaria was focused on the metal wellbeing.

Group photographs of the participants with Resource Person

(ii) Workshop on Empowering Women Professionals in STEM (EWPS-2025) at NIT Hamirpur

The two-day workshop on "Empowering Women Professionals in STEM (EWPS-2025)*"* was held from February 21-22, 2025, at NIT Hamirpur, under the aegis of the ANRF (SERB) - INAE Women Engineers Program. The workshop aimed to address the specific needs of women faculty in engineering education by enhancing their pedagogical skills, fostering leadership capabilities, building legal awareness, and supporting their academic growth and research initiatives. The workshop brought together 40 women

faculty members and professionals from NIT Hamirpur and IIIT Una, focusing on equipping them with practical tools to advance their careers and contribute more effectively to academia and research.

The workshop commenced on February 21, 2025, with a registration session followed by a formal inaugural ceremony. The Chief Guest, Prof. H. M. Suryawanshi, Director, NIT Hamirpur, graced the occasion alongside Prof. Anoop Kumar, Dean Faculty Welfare, and Dr. Archana S. Nanoty, Registrar, NIT Hamirpur. Dr. Veena Sharma welcomed the participants and introduced the vision of the workshop, highlighting the roles of INAE and ANRF in supporting academic excellence and gender equity. The opening addresses by the Dean FW and Registrar reflected the administration's strong support for such faculty development initiatives. Director Prof. Suryawanshi's motivating speech emphasized the importance of fostering a supportive environment for women educators. The session concluded with remarks by Dr. Gargi Khanna, the Workshop Coordinator, who outlined the schedule and goals of the event.

Over the course of two days, the workshop featured expert-led sessions covering a diverse range of themes including pedagogy, leadership, legal frameworks, soft skills, research development, and policy awareness. The key sessions are outlined below:

Pedagogical Proficiency for Women Engineers

Dr. Archana S. Nanoty discussed innovative, interactive, and technology-enabled teaching methodologies to improve student engagement and academic outcomes, especially in the context of engineering disciplines.

Strategic Lesson Planning and Classroom Management

Prof. Rajeevan Chandel focused on effective lesson planning, structuring curriculum, and managing diverse classroom environments, with actionable strategies tailored for engineering faculty.

Legal Frameworks and Policy Awareness

Dr. Seema Kashyap covered key legal frameworks impacting women in academia, with particular emphasis on the Prevention of Sexual Harassment (PoSH) Act, creating awareness to promote safer, more inclusive academic environments.

Empowering Women Engineers through Effective Teaching Techniques

Dr. Meenakshi Sood introduced practical teaching strategies and shared inspiring examples of women engineers excelling in academia and leadership roles.

Soft Skills as the Backbone of Sustainable Human Capital

Prof. Sivaji Chakravorti, Vice President, INAE highlighting the importance of communication, adaptability, and critical thinking, shared real-life examples of soft skills being essential to career sustainability and leadership.

Leadership and Team Engagement

Dr. Gargi Khanna, NIT Hamirpur focused on cultivating leadership traits among women professionals, the session included hands-on team engagement activities facilitated by Dr. Veena Sharma and Dr. Bharti Koul.

Life Skills Development

Dr. Sunder Kala Negi and Dr. Rinshu through experiential activities helped participants develop interpersonal, cognitive, and stress management skills crucial for personal and professional well-being.

Advancing Research and Innovation in the Contemporary Landscape

Prof Sivaji Chakravorti, Vice President, INAE helped participants explore methodologies, innovation ecosystems, and funding avenues to promote active engagement in research.

Work-Life Balance for Women Engineers

Dr. Meenakshi Sood addressed challenges women faculty face in balancing career and family, with practical suggestions for achieving harmony through institutional and personal strategies.

Project Proposal Writing Skills

Dr. Anju Batta Sehga designed a session to help participants draft effective project proposals, understand funding agency requirements, and articulate research objectives clearly.

Implementation and Perspective of NEP 2020

Dr. Ravinder Nath Sharma, concluded technical session explored the opportunities and challenges introduced by the New Education Policy (NEP) 2020, particularly its implications for women educators and researchers.

The workshop concluded with a valedictory session presided over by Prof. Sivaji Chakravorti, Vice President, INAE, with the presence of Prof. H. M. Suryawanshi, Director, NIT Hamirpur, and Dr. Archana S. Nanoty. The workshop outcomes were presented, and the official proceedings of the workshop were released during the session. The EWPS-2025 workshop achieved its primary goals of building pedagogical capacity and promoting leadership among women in engineering education.

Major outcomes included:

- Enhanced awareness and adoption of student-centric teaching methodologies
- Improved leadership and team management skills among women faculty
- Increased understanding of legal protections and institutional policies
- Practical insights into writing competitive research proposals
- Development of soft skills and life management tools
- Strengthened academic networking and peer collaboration'

Receiving the Chief guest and others for Inaugural Ceramony at NIT Hamirpur

Inaugural Session in progress

Group Photograph of the Women Participants at NIT Hamirpur

C. SERB-INAE Outreach Programs for NE, J&K and Ladakh

(i) Workshop on Skill Development of Women at NIT Mizoram

The National Institute of Technology Mizoram, under the aegis SERB-INAE Outreach Programs for NE, J&K and Ladakh, successfully hosted a three-day workshop on "Skill Development of Women" from February 19 to 21, 2025. This workshop was a significant outreach initiative targeting women from the North-East region, Jammu & Kashmir, and Ladakh, with the objective of enhancing professional skills, leadership qualities, and entrepreneurial mindset among women through expert sessions, discussions, and a Women's Empowerment Hackathon.

The workshop commenced with a formal inaugural ceremony held at the Conference Hall, Administrative Building. The ceremony was graced by Prof. Sivaji Chakravorti, Vice President, INAE, who delivered an enlightening address on the importance of skill development and women's emowerment. Prof. Saibal Chatterjee, Dean R&C and the Coordinator of the Workshop, welcomed participants and emphasized the importance of the sessions, encouraging attendees to make the most of the learning opportunities.

DAY 1

Session I: "Cultivating Essential Soft Skills to Thrive in a World of Constant Change – Part I" Prof. Chakravorti, Vice President, INAE emphasized the relevance of soft skills such as communication, patience, adaptability, and teamwork for women navigating professional environments. He discussed

techniques like the Pareto Principle and STAR method for effective problem-solving and highlighted the role of observation, time management, and confidence in professional growth.

Session II Topic: "Cultivating Essential Soft Skills to Thrive in a World of Constant Change – Part II"
This session focused on Magnetic Resonance Imaging (MRI) as an example of scientific principles leading to engineering applications. Prof. Chakravorti elaborated on MRI's relevance to women's health and stressed the importance of encouraging more women to participate in STEM disciplines to foster inclusive technological advancement.

Hackathon Preparation Session Led by: Dr. Vijay Mandal, Assistant Professor, Dept. of ME, NIT Mizoram

The session included discussions on hackathon guidelines, prototype development, team finalization, poster presentations, and group dynamics.

DAY 2

Keynote Address: "Law and Women's Rights"
Prof. Dilip Ukey, Vice Chancellor, National Law University, Mumbai highlighted vital legal protections for women, including laws addressing workplace harassment, domestic abuse, and inheritance rights. He emphasized that legal literacy empowers women to make informed decisions and advocate for their rights in both personal and professional domains.

Session: Women Entrepreneurs of Mizoram
Speakers:

- Ms. Zosangzeli Chhakchhuak – Coffee Entrepreneur
- Ms. Lalhlupull Ralte – Perfume Entrepreneur
- Ms. Esther Laltanpull Khiangte – Software Professional

These women leaders shared real-world insights on entrepreneurship, financial support systems like the Mizoram Start-Up Policy, and the importance of innovation, product quality, and digital proficiency. They collectively emphasized mentorship, financial literacy, and strategic thinking for sustained success in the business and tech sectors.

Participants at the end of Day 2 toured NIT Mizoram's state-of-the-art 5G Laboratory, led by Dr. Anumoy Ghosh, Assistant Professor, ECE Department, who provided a comprehensive overview of cutting-edge wireless communication technologies. The session was attended by the entrepreneurs as well, showcasing the intersection of technical innovation and business potential.

DAY 3

Keynote Lecture by: Lieutenant Commander Aishwarya Boddapati, decorated naval officer and member of the *Navika Sagar Parikrama* – India's first all-women global sailing expedition. Her session focused on resilience, leadership, strategic thinking, and mental fortitude. She urged participants to step into leadership roles and embrace challenges as opportunities for growth. Her inspirational journey deeply resonated with the audience.

Group Discussions: A Women's Empowerment Hackathon was held, featuring six teams engaging in group discussions on various women empowerment topics assigned by the organizers. The session was highly productive, with participants showcasing insightful perspectives and innovative solutions. The discussions highlighted key issues like gender equality, financial independence, and leadership. The session was carefully monitored and evaluated by Prof. K. G. Singh and Dr. Shuchi of NIT Mizoram. The

hackathon fostered teamwork, critical thinking, and confidence among participants, reinforcing the importance of empowering women through collaborative problem-solving and strategic thinkingSix teams discussed critical themes around women's empowerment, including gender equity, leadership, financial independence, and digital inclusion.

Team Presentations and Poster

Display: Eight teams presented innovative, tech-driven solutions addressing societal challenges faced by women. Proposals ranged from digital education platforms to financial management apps for women in rural areas. Judges evaluated teams based on creativity, feasibility, and societal impact.

Chief Guest Prof. S. Sundar, Director, NIT Mizoram, along with Lt. Cdr. Boddapati and Prof. Saibal Chatterjee, felicitated the winners and distributed prizes for Group Discussions, Poster Presentations, and the Hackathon.

Prof. Saibal Chatterjee, Dean R&C and Workshop Convenor, offered the closing remarks by highlighting the enhancement of soft skills, legal awareness, technical know-how, and entrepreneurial capability among participants and the success of the Women's Empowerment Hackathon in driving collaboration and innovation. The Skill Development Workshop for Women was a landmark event that brought together academia, industry, entrepreneurs, and defence personnel to inspire, train, and empower women from diverse backgrounds. Through a blend of technical sessions, leadership insights, and collaborative hackathons, the workshop reinforced the transformative potential of women in engineering, entrepreneurship, and leadership. It concluded as a resounding success, aligning with national goals of inclusive innovation and skill development.

Prof. S Sundar, Director,felicitating Prof Sivaji Chakravorti during Inaugural Ceremony

Winners at Hackathon Presesntation

Participants at NIT Mizoram

(ii) Workshop on "Skill Enhancement Workshop in Teaching and Research" at IIT Guwahati

IIT Guwahati under the aegis SERB-INAE Outreach Programs for NE, J&K and Ladakh successfully organized a two days' Workshop on Skill Enhancement Workshop in Teaching and Research during Feb 28, 2025 and March 1, 2025.

The Workshop was a dynamic and impactful two-day initiative dedicated to strengthening the academic capabilities of faculty members and research scholars. Recognizing that faculty are the cornerstone of any higher education institution, the workshop aimed to equip them with the pedagogical, research, and professional tools necessary to inspire students and advance scholarly output in their respective fields. The modern academic environment demands that educators go beyond traditional methods and embrace innovative strategies and technologies that make teaching more interactive, inclusive, and impactful.

This workshop was designed to meet those evolving needs—blending practical learning with thought-provoking discussions and expert-led sessions. Focused on both teaching excellence and research innovation, the program provided an enriched platform for participants to explore cutting-edge methodologies, research tools, grant-writing techniques, and best practices in industry collaboration. By addressing both theoretical and practical elements of academic work, the event contributed meaningfully to participants' professional growth.

The primary goal of the workshop was to empower educators and researchers with the skills needed to thrive in a fast-evolving academic landscape. The specific objectives included:

1. **Enhancing Teaching Methodologies and Pedagogy:**
   The workshop introduced participants to learner-centric approaches, such as outcome-based education (OBE) and problem-based learning (PBL), helping educators make teaching more interactive and aligned with real-world applications.
2. **Developing Research Proficiency:**
   Sessions were held on formulating research questions, conducting literature reviews, designing research methodologies, and academic writing, enabling participants to produce more impactful scholarly work.
3. **Grant Proposal Writing and Funding Opportunities:**
   Participants were trained on how to identify funding agencies, write compelling proposals, and comply with submission guidelines—key steps in securing research grants.
4. **Improving Research Communication Skills:**
   Techniques for effective research presentations and public speaking were emphasized, with a focus on tailoring communication for academic conferences, journals, and interdisciplinary audiences.
5. **Fostering Industry-Academia Collaboration:**
   The workshop emphasized the importance of establishing partnerships with industry to align research with societal and market needs, bridging the gap between theoretical knowledge and practical application.
6. **Implementing Innovative Teaching Tools:**
   Sessions included the use of technology-driven tools like Learning Management Systems (LMS), digital assessment platforms, and classroom engagement apps to enhance student-teacher interaction.
7. **Promoting Wellness and Resilience in Academia:**
   Recognizing the challenges of academic life, a special session focused on maintaining mental well-being, building resilience, and creating supportive learning environments.

Key Themes Covered

- Effective classroom strategies and student engagement models
- Research ethics and academic integrity
- Collaboration with industry: pathways and best practices
- Emerging trends in engineering education and research
- Scholarly communication and peer-reviewed publishing
- Stress management and faculty wellness
- Strategies for continuous professional development

Outcomes

By the conclusion of the workshop, participants were expected to:

- Gain deeper insights into modern teaching methods and tools
- Enhance their research design and writing capabilities
- Build awareness of funding opportunities and proposal drafting techniques
- Improve their academic presentation and communication skills
- Establish initial links for cross-institutional and industry collaborations
- Be more resilient and aware of personal wellness strategies to sustain academic excellence

The Skill Enhancement Workshop in Teaching and Research served as a crucial platform for capacity building among faculty and scholars. With a well-rounded curriculum addressing both pedagogical and research-oriented competencies, the program successfully met its goal of preparing educators for the future of higher education. The event fostered collaboration, encouraged innovation, and reinforced the importance of continuous learning in academic careers. Participants left the workshop better equipped to engage students, contribute to research advancements, and take proactive steps in their own professional journeys.

Participants attending the session during the workshop

Group Picture of the Attendees with the Resource Persons

(iii) Workshop on "Modern Pedagogical Techniques for Student-Centric Learning in Engineering Education" at IIT Jammu

In response to the growing need for transforming engineering education through student-centric learning approaches, the Centre for Essential Skills (CES), IIT Jammu, organized a two-day workshop titled "Modern Pedagogical Techniques for Student-Centric Learning in Engineering Education" from February 24 to 25, 2025. The workshop was conducted under the aegis of ANRF (SERB) - INAE Outreach Programs aimed at empowering educators and aspiring faculty from the Northeast, Jammu & Kashmir, and Ladakh regions.

Rooted in the principles of the National Education Policy (NEP) 2020, the program aimed to enhance pedagogical effectiveness by equipping participants with modern teaching methodologies, digital integration strategies, and a comprehensive understanding of student learning processes. It particularly addressed the lack of formal pedagogical training among Ph.D. scholars and early-career faculty, providing a structured platform for collaborative learning, knowledge exchange, and practical skill development.

The workshop welcomed 35 participants, including faculty members and research scholars from Government Degree Colleges (GDCs) of Srinagar, Sopore, Pulwama, Doda, Ramnagar, and Jammu, alongside representatives from the Islamic University of Science & Technology (IUST), Kashmir, and IIT Jammu. This diverse representation laid the groundwork for a regional pedagogical network that promotes best practices, collaboration, and sustainable growth in engineering education across the region.

The inaugural ceremony was graced by a distinguished panel of academicians and leaders, including Prof. Sivaji Chakravorti, Vice-President, Indian National Academy of Engineering (INAE), Prof. Manoj Singh Gaur, Director, IIT Jammu, Prof. C. S. Upadhyay, IIT Kanpur, Prof. Shyam Narayan Lal, Visiting Professor at IIT Jammu, and Prof. Abhay Sharma, Dean of Education and Outreach at IIT Jammu.

The workshop was structured into expert-led sessions, breakout discussions, and group presentations, all of which were aimed at enhancing both theoretical understanding and practical application of teaching strategies. The first day commenced with an enlightening session by Prof. C. S. Upadhyay, IIT Kanpur who introduced the concept of various teaching-learning styles and how recognizing different learner types can help educators tailor their instruction to maximize engagement and retention. His session laid the foundation for exploring how flexible and adaptive teaching can significantly improve learning outcomes.

Following this, Prof. Sivaji Chakravorti delivered an inspiring talk on the role of soft skills in education and professional life. His session highlighted essential interpersonal and communication skills that every educator must cultivate, such as empathy, active listening, adaptability, and clarity in delivery. This was followed by a thought-provoking lecture by Dr. Sanchita Srivastava, IIT Jammu on learners' development and educational psychology, where she emphasized the need to understand the cognitive and emotional development of students to foster inclusive and psychologically safe learning environments.

Later in the day, Dr. Gaurav Ashok Bhaduri, IIT Jammu conducted a session on the effective use of teaching aids. His interactive approach allowed participants to explore the strategic use of digital and visual tools to enhance clarity and engagement in classroom instruction. The most interactive component of Day 1 was the breakout session, where participants were divided into groups to discuss practical teaching issues, including student assessment methods, hybrid learning challenges, maintaining student attention, and the cognitive underpinnings of effective pedagogy. These sessions, moderated by faculty from IIT Jammu, encouraged peer learning and experience sharing, creating a collaborative platform for solving real classroom challenges.

Day 2 of the workshop began with an engaging session on leadership in pedagogy, delivered by Prof. Bijoy Boruah, IIT Jammu. This session encouraged participants to view educators not only as transmitters of knowledge but as mentors and leaders capable of shaping students' aspirations and academic trajectories. Following this, Prof. Shyam Narayan Lal, IIT Jammu addressed the topic of inclusive and equitable education. His session focused on overcoming regional, cultural, and socioeconomic barriers that hinder student participation and performance, especially in underserved and marginalized communities. He stressed the need for equity-driven curriculum planning and culturally responsive teaching.

The concluding segment of the workshop was designed to reinforce the knowledge gained by participants. It included a group presentation session, during which attendees synthesized their insights from the various discussions and expert lectures. Each group shared actionable strategies for improving pedagogy in their respective institutions, covering aspects such as curriculum design, classroom management, use of educational technology, and fostering inclusive environments. By the end of the two days, the workshop had made a significant impact on all participants. It not only increased awareness of student-centric and active learning strategies but also provided a rare opportunity for educators from geographically diverse institutions to collaborate, reflect, and grow together. Importantly, the workshop aligned with NEP 2020's recommendation that all future faculty, including Ph.D. scholars, should undergo formal training in pedagogy.

Looking ahead, the workshop highlighted the urgent need for continued faculty development. Participants expressed a strong desire for follow-up programs that delve deeper into specific teaching tools and digital platforms, as well as opportunities for hands-on teaching simulations. There was also a consensus on the importance of establishing a regional pedagogical network, which could serve as a hub for sharing best practices, mentoring young faculty, and driving innovation in curriculum design and delivery. In conclusion, the workshop on "Modern Pedagogical Techniques for Student-Centric Learning in Engineering Education" was a major success. It addressed key gaps in engineering pedagogy, empowered faculty with actionable tools, and created a strong foundation for regional collaboration in higher education. Hosted by IIT Jammu and supported by INAE and SERB, the event reinforced the critical role that effective teaching plays in shaping the future of technical education in India.

Lamp lighting ceremony at Inaugural function


Prof Sivaji Chakravorti delivering talk

Group Photographs of the participants with the resource persons

Engaging session on leadership in pedagogy

Group Photographs of the participants

D. SERB-INAE Innovation Hackathon

(i) Youth Conclave 2024

The Youth Conclave 2024 organized by the Indian Institute of Technology Bhilai (IIT Bhilai), under the umbrella of SERB-INAE Innovation Hackathon during Dec 12-13, 2024 unfolded as a vibrant celebration of student innovation, entrepreneurial spirit, and technological creativity. Drawing participation from engineering students across Chhattisgarh and beyond, the conclave served as a significant platform for emerging innovators to showcase their ideas and interact with leading experts from academia and industry.

The inauguration ceremony of the conclave was held in the presence of distinguished dignitaries, who joined virtually and in person. The event commenced with welcome remarks and was graced by the esteemed presence of Prof. N. V. Ramana Rao, Director, NIT Raipur; Prof. Sivaji Chakravorti, Vice President, Indian National Academy of Engineering (INAE); Prof. Rajiv Prakash, Director, IIT Bhilai; and Dr. Nagesh D. Patil, Associate Professor, IIT Bhilai and the Coordinator of Youth Conclave 2024.

Prof. Indranil Manna, President, INAE inaugurated the conclave with a presidential speech that set the tone for the day. His address was both inspiring and forward-looking, emphasizing the importance of youth-led innovation in tackling the pressing challenges of modern society.

During the inaugural session, Prof. Rajiv Prakash urged the students to think beyond conventional approaches and come up with practical, amicable solutions to real-world problems. His words resonated with the spirit of the event, which was to empower young minds to become changemakers in society. Prof. Sivaji Chakravorti, drawing upon his extensive experience in both academia and industry, spoke about the concept of frugal innovation—the art of developing cost-effective and resource-efficient solutions without compromising on impact. He stressed that such innovations are crucial for a country like India, where affordability and sustainability often define the success of a technological solution.

Adding further depth to the discussion, Prof. N. V. Ramana Rao spoke about the emerging importance of innovation in sectors such as Agritech, Healthtech, Fintech, and Sustainable Technologies. He illustrated how advancements in these areas are not only transforming industries but are also essential for societal progress and national development.

The core of Youth Conclave 2024 featured a series of keynote lectures delivered by highly accomplished professionals, each offering a wealth of knowledge and personal insights.
Among the keynote speakers was Prof. N. V. Ramana Rao, who elaborated on the convergence of technology with Agritech, Healthtech, Fintech, and sustainability, highlighting successful models and future opportunities in these sectors. Prof. Sivaji Chakravorti followed with a thought-provoking session on "The Backbone of Sustainable Human Capital", discussing the human element in innovation ecosystems and the role of education in nurturing problem-solvers.
Prof. P. Chakrabarti, Former Director of IIEST Shibpur and NIT Allahabad, as well as a former faculty member at IIT BHU, delivered a captivating lecture on the "Impact of Disruptive Innovations on Industries". He charted the trajectory of technological disruptions and their implications for business and society. Rounding off the keynote series, Mr. Prashant Mathur, CEO of the Innovation and Technology Foundation (IBITF) under NM-ICPS – DST, gave a highly motivational talk titled "Innovations and Entrepreneurship", inspiring students to not just ideate but to commercialize and scale their solutions through entrepreneurship.

Apart from the keynote addresses, the conclave hosted a variety of interactive and competitive events designed to engage participants and stimulate innovation. These included oral presentations, poster sessions, and a highly anticipated Innovation Hackathon. These platforms allowed students to present their technological ideas, prototypes, and research in front of a technical jury.

The response to Youth Conclave 2024 was overwhelming, with nearly 220 engineering students from universities and technical institutions across Chhattisgarh participating actively. Students showcased their work on a wide range of themes that reflected national and global relevance—particularly in Agritech, Healthtech, Fintech, and sustainability. These ideas were evaluated rigorously by a dedicated technical committee from IIT Bhilai, which also offered valuable suggestions for further development and potential real-world application.

The event culminated in a grand valedictory session, where reflections on the conclave's outcomes were shared and winners were felicitated. During the session, both Prof. P. Chakrabarti and Prof. Rajiv Prakash reiterated the pivotal role of innovation in engineering and technology for the overall betterment of society and the nation. They encouraged the participants to continue nurturing their curiosity, creativity, and drive to solve meaningful problems.

The session concluded with the distribution of participation certificates, followed by the announcement of winners in various categories:

- **Poster Presentation Awards:**
  - 1st Prize: Mr. Kishan Tamboli (IIT Bhilai) for his project "Efficient Graph Triangle Counting on Modern GPUs."
  - 2nd Prize: Ms. Deepika Sharma (IIT Bhilai) for her work on "Computational Strategies for Mitigating Water Contamination in Agriculture."

- **Oral Presentation Awards:**
  - 1st Prize: Mr. Yogesh Kumar Dewangan
  - 2nd Prize: Mr. Rishabh Ranjan Jha
  - 3rd Prize (Jointly): Ms. Anjali Yadav and Mr. Agniv Tapadar

- **Innovation Hackathon Awards:**
  - Awarded to high-performing student teams from NIT Raipur and BIT Durg, whose inventive solutions stood out in terms of feasibility, originality, and social impact.

The Youth Conclave 2024 concluded on a high note, not just as an event, but as a launchpad for young innovators. It successfully created a space for vibrant exchange of ideas, peer learning, and exposure to expert mentorship. More than just a competition or a lecture series, the conclave served as a catalyst for nurturing the spirit of innovation among India's next generation of engineers and technologists.

As the valedictory session drew to a close, it was evident that the seeds of change had been sown. The conclave marked not just the culmination of a well-executed event, but the beginning of a journey for many young minds ready to build solutions for a better tomorrow.

The dignitaries are lighting the lamp during the inaugural ceremony on 12th Dec, 2024

Prof Indranil Manna, President, INAE delivering Presidential Address during Inaugural function

The dignitaries on stage during the inaugural Ceremony on 12th Dec, 2024

Prof. N V Ramana Rao (Director, NIT Raipur) delivering keynote address

Prof. P. Chakrabarti during keynote address

Participating Students attending the keynote address

Group Photograph of the participants of Youth Conclave

(ii) **AVINYA 2025 at MVJ College of Engineering (MVJCE), Bangalore**

In a spirited celebration of creativity, problem-solving, and technological innovation, MVJ College of Engineering (MVJCE), Bangalore, hosted AVINYA 2025, a 30-hour continuous hackathon — on March 19 - 20, 2025. The event was conducted in collaboration with the Indian National Academy of Engineering (INAE), under the aegis of ANRF (SERB) as part of the ANRF (SERB) – INAE Innovation Hackathon.

True to its Sanskrit namesake, *"Avinya,"* meaning innovation, the hackathon sought to inspire and engage the brightest young engineering minds from institutions across the country. The event focused on creating impactful technological solutions under three major themes: Healthcare and Management, Smart Vehicles, and Cybersecurity & Blockchain.

The two-day event commenced on March 19, 2025, with an opening ceremony held at MVJCE's Smt. Rajalakshmi Seminar Hall. Dr. Ajayan K.R., Principal of MVJCE, delivered the welcome address, expressing his enthusiasm for the partnership between MVJCE and INAE. He proudly highlighted the recent Memorandum of Understanding signed between the two institutions, which had already yielded two successful events in a short span of one month. Dr. Ajayan emphasized the importance of such collaborations in fostering innovation and providing students with exposure to real-world engineering challenges.

The Presidential Address was delivered virtually by Mr. J.D. Patil, President, INAE. In his speech, Mr. Patil elaborated on the history and mission of INAE, underscoring its role in promoting excellence and innovation in engineering across India. He emphasized the transformative power of hackathons in identifying real-life challenges and cultivating innovative, entrepreneurial thinking among students. His remarks highlighted how such platforms contribute not only to national development but also to job creation and sustainable technological growth.

Following this, the Inaugural Address was presented by Prof. Sivaji Chakravorti, Vice President, INAE. Through an engaging and story-driven narrative, Prof. Sivaji emphasized the importance of thinking differently. He encouraged the participants to embrace teamwork, curiosity, and resilience throughout the hackathon. The ceremony concluded with a heartfelt vote of thanks by Dr. M. Brindha, Dean of Affiliation & Accreditation at MVJCE and the Coordinator of AVINYA 2025, who expressed her gratitude to all dignitaries, participants, evaluators, and organizing members for their commitment and contributions.

Hackathon Highlights and Activities

The hackathon was structured as an intense, uninterrupted 30-hour innovation sprint, where student teams from various engineering institutions worked on domain-specific problem statements. These problem areas were distributed across three thematic tracks:

E. Healthcare and Management
F. Smart Vehicles
G. Cybersecurity & Blockchain

Each team worked under continuous mentorship and assessment from domain experts, who provided real-time feedback and guidance. Participants demonstrated exceptional ingenuity and technical skill in tackling diverse real-world challenges. Notable projects included:

- AI-powered smart glasses for early glaucoma detection
- Non-invasive hemoglobin monitors for patient care
- Blockchain-enabled platforms for secure welfare scheme management and decentralized medical equipment rental
- Smart accident detection and response systems integrated into autonomous vehicle prototypes
- Expose Net, a browser extension to improve online transparency and accountability
- Little Imaginators, a youth-oriented initiative that encouraged younger students to dream big and innovate early

These projects reflected a blend of technical depth and social impact, showcasing how student-led innovation can influence both industry and society.

AVINYA 2025 also featured inspirational keynote addresses by renowned industry leaders:

- Mr. Subbaraja Sirasala, Senior Enterprise Solutions Architect at GE Aerospace, addressed participants on the "Role of Technology & Its Impact on Cybersecurity". He discussed the ever-evolving nature of digital threats, the growing role of AI and machine learning in cyber defense, and the urgent need for resilient systems and proactive defense strategies.
- On Day 2 (March 20, 2025), Mr. Shravan S. Naidu, Principal Architect and Director at Alegeus, delivered a talk titled "Engineering Beyond the Classroom: The Journey of Lifelong Learning." He encouraged students to embrace a mindset of continuous learning, adaptability, and personal growth — traits that are indispensable in a rapidly changing technological world.

Thematic Competitions and Judges

The hackathon's competitive segment was divided into three thematic tracks, each evaluated by eminent experts from academia and industry:

1. Healthcare and Management (10 teams)
   Judges:
   - Mr. Vasantha Kumar, Engineering Manager, Alegeus, Bangalore
   - Mr. Shravan S. Naidu, Principal Architect & Director, Alegeus, Bangalore
2. Smart Vehicle (9 teams)
   Judges:
   - Dr. Raghavendra, Professor, IISc, Bangalore
   - Mr. Bejoy John, Senior Director, OWS Manufacturing Shops, GE Aerospace, Bangalore
3. Cybersecurity & Blockchain (8 teams)
   Judges:
   - Mr. Navdeep Agarwal, Senior Security Architect, GE Healthcare, Bangalore & Director, ISC2
   - Mr. Subbaraja Sirasala, Senior Enterprise Solutions Architect, GE Aerospace, Bangalore

The projects were assessed based on criteria such as innovation, feasibility, scalability, teamwork, presentation, and alignment with the chosen theme.

To offer a well-rounded experience and celebrate the spirit of creativity, a cultural program was held on the evening of March 20. Organized by MVJCE's student-led clubs, the RaagAbhinaya Club presented a stage play and short films, while the Saahitya Club conducted an expressive slam poetry session. These cultural showcases added an artistic and reflective dimension to the highly technical event.

The hackathon concluded with a final evaluation and announcement of results, marking the end of 30 hours of brainstorming, coding, designing, and problem-solving.
AVINYA 2025 proved to be an outstanding example of how collaborative academic-industry initiatives can nurture future-ready engineers. By combining intensive hands-on experiences, inspirational thought leadership, and vibrant student participation, the event cultivated a fertile ground for ideation, learning, and innovation.

This landmark event reaffirmed the role of engineering education in addressing national and global challenges. As AVINYA 2025 came to a close, it left behind a legacy of inspired minds, new connections, and a renewed drive to innovate for a better future.

Mr. J D Patil, President, INAE addressing students on 19th March 2025 at Dr. M V Jayaraman Auditorium

Judges of Cyber Security & Block Chain Theme evaluating the students'

Prof. Sivaji Chakravorti, Vice President, INAE interacting with students

Students of Erode Sengunthar Engineering College receiving prize