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Department of Aerospace Engineering and Applied Mechanics

Newsletter: March - September 2025

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

Opening Note from the Head of Department

Dear Faculty, Students, Alumni, and Esteemed Colleagues,

It is with immense pride and pleasure that I present to you our departmental newsletter for the period March to September 2025. This edition chronicles a remarkable phase in our department's journey, marked by exceptional achievements in research, academics, and community engagement.

As we stand at the forefront of aerospace engineering education in India, our department continues to embody the spirit of innovation and excellence that has been the hallmark of IIEST Shibpur since its establishment in 1856.

I extend my heartfelt gratitude to all faculty members, research scholars, students, and staff

who have made these accomplishments possible. Their dedication, hard work, and passion for excellence continue to elevate our department's reputation on national and international platforms.

As we move forward, we remain committed to nurturing the next generation of aerospace engineers who will shape the future of aviation and space exploration. Together, we continue our mission to transform dreams into reality, reaching ever greater heights in aerospace engineering.

With warm regards,

Prof. Rana Roy
Head of Department
Aerospace Engineering and
Applied Mechanics
IIEST Shibpur

Message from the Department

The Department of Aerospace Engineering and Applied Mechanics is pleased to present our newsletter covering the remarkable activities and achievements during March-September 2025. This period has been marked by significant milestones in research, academic excellence, and meaningful contributions to India's space program. From celebrating National Space Day to advancing cutting-edge research in computational fluid dynamics and sustainable aerospace technologies, our department continues to strengthen its position as a leader in aerospace education and innovation.

HIGHLIGHTS OF THE PERIOD

Abhiantrix – Celebrating Innovation through Competition

March 21-23 , 2025

The department hosted its flagship student technical festival, Abhiantrix 2025, a vibrant confluence of creativity, competition, and engineering spirit. Students from various disciplines showcased their technical prowess and teamwork in several challenging competitions.

Event Highlights:

- Hovercraft Challenge: Teams designed working hovercraft prototypes capable of navigating predefined tracks. Innovative propulsion systems and aerodynamic stability were key judging criteria.

- Drone Navigation Competition: Participants created drones that navigated a challenging obstacle course, demonstrating precision control, real-time feedback systems, and stable manoeuvring.

- Water Rocket Launch: This hands-on engineering challenge involved building and launching rockets powered by compressed air and water, judged based on height, distance, and creativity of design.

Abhiantrix continues to inspire the next generation of aerospace engineers through practical, project-based learning.

International Seminar cum Workshop on Aerospace Advancements (AAFDA 2025)

The department proudly hosted a prestigious international event titled "Advancements, Applications, and Future Directions in Aerospace Engineering (AAFDA)", held on 2nd–3rd March 2025. This seminar-cum-workshop was jointly organized by the Department of Aerospace Engineering and Applied Mechanics (AE&AM), IIEST Shibpur, in collaboration with the Aeronautical Society of India (AeSI), Kolkata Chapter.

Inaugural Ceremony:

The event commenced on 2nd March 2025 at 10:00 a.m. in the Alumni Seminar Hall, 1st Floor of the Acharya Jagadish Chandra Bose Building. The inaugural session was graced by distinguished guests:

- Prof. V. M. S. R. Murthy, Hon'ble Director, IIEST Shibpur

- Dr. G. Satheesh Reddy, President, AeSI; Former Chairman, DRDO; Scientific Adviser to Raksha Mantri
- Dr. Nityananda Nandi, HOD, AE&AM
- Gp Capt. Tapas Kumar Ray, Chairman, AeSI Kolkata Chapter

The seminar addressed frontier topics such as UAV dynamics, propulsion advancements, smart materials, and space technology. It featured keynote lectures and technical sessions.

🚀 National Space Day Celebration: "Aryabhata to Gaganyaan"

August 23, 2025

The Department proudly celebrated National Space Day with the inspiring theme **"Aryabhata to Gaganyaan: Ancient Wisdom to Infinite Possibilities"** at Gallery IV, 1st Floor, Old Academic Building. The event commenced at 10:30 AM with Prof. Pratik Datta, Dean (Research and Consultancy), gracing the occasion as Chief Guest.

Event Highlights:

- Faculty presentations tracing India's space journey from ancient astronomical heritage to modern missions
- Student presentations showcasing innovative research work
- Awards ceremony recognizing best performers
- Enthusiastic participation from faculty colleagues and students

The celebration was expertly coordinated by:

- **Dr. Pabitra Halder** (Chairman, Departmental Student Activities and Sensitization Cell)
- **Dr. Indrajit Mukherjee** (Convener)

🤝 Indo-U.S. Synergies in Science and Technology

August 13, 2025

Department faculty actively participated in the panel discussion **"Exploring Indo-U.S. Synergies in Science and Technology Learning Ecosystems"** at the American Center Library. The session, held from 10:30 a.m. to 1:30 p.m., explored collaborative opportunities between Indian and American educational institutions in STEM fields.

Department Representatives:

- Dr. Joydeep Bhowmik
- Dr. Prince Raj Lawrence Raj
- Dr. Pratim Kumar
- Dr. Indrajit Mukherjee

The panel emphasized building stronger Indo-U.S. partnerships in STEM education, research, and innovation, focusing on integration of schools, universities, industries, and community initiatives.

Green Campus Initiative

June 14, 2025

The Department actively participated in the Green Campus – Clean Campus Drive, demonstrating our commitment to sustainability and environmental responsibility. The initiative began at 9:00 AM with an assembly at Netaji Bhavan, witnessing enthusiastic participation from faculty, staff, and students across all academic levels.

RESEARCH EXCELLENCE

Recent Publications in High-Impact Journals

Physics of Fluids Study

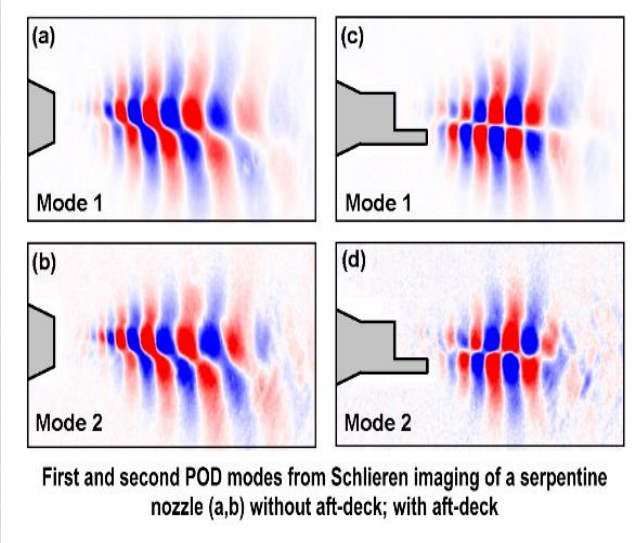
Our researchers published groundbreaking work on **modal decomposition of wake flow behind circular and square cross-sections** using Spectral Proper Orthogonal Decomposition (SPOD). This computationally intensive data-driven technique successfully isolated dominant spatial modes specific to vortex-shedding frequency, enabling meaningful comparisons of velocity and vorticity field characteristics.

Aero-Acoustic Research

An experimental investigation into the **influence of triangular aft-deck on aero-acoustic**

behavior of serpentine nozzles was published in the International Journal of Aeronautical and Space Sciences by **Dr Ajmira Nageshwara Rao** and **Dr. T Nilavarasen** . The study presented:

- Velocity measurements and Schlieren imaging
- Proper Orthogonal Decomposition (POD) analysis
- Near- and far-field microphone data analysis
- Findings on aft-deck's role in reducing downward jet vectoring and acoustic field redistribution



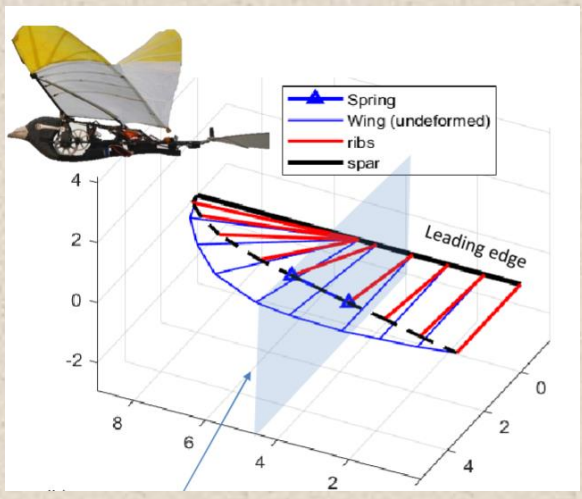
First and second POD modes from Schlieren imaging of a serpentine nozzle (a,b) without aft-deck; with aft-deck

Biomimicking unmanned aerial vehicle (UAV)

Dr. Joydeep Bhowmik published notable research highlighting the development of a biomimicking unmanned aerial vehicle (UAV) inspired by bird flight.

The study, titled "A nonlinear iterative approach to predict large deflections of a novel spring-loaded ornithopter wing," was published in the journal Meccanica.

This research introduces a new design of an ornithopter wing with controllable stiffness, which can be varied according to design requirements using a spring attached to the trailing edge.



Research Publications Performance

2025 Publication Statistics:

- **Journals:** 32 publications
- **Conferences:** 10 publications
- **Books:** 3 publications

All-Time Publications (Up to 2025):

- **Total Journals:** 329
- **Total Conferences:** 273
- **Books & Chapters:** 25

This impressive portfolio underscores our sustained commitment to research dissemination

and academic leadership in aerospace engineering and applied mechanics.

FUNDED PROJECTS AND RESEARCH INITIATIVES

Cumulative Project Portfolio

- **Total Projects:** 61
- **Major Funding Agencies:** SERB/DST, DRDO, CSIR, MHRD, UGC, Ministry of Earth Sciences, DBT, and private industry partners
- **Research Areas:** Unmanned vehicle design, advanced prosthetics, materials development, river and hydraulic engineering, robotics, and industrial consultancy

INDUSTRY TRENDS AND FUTURE OUTLOOK

Aerospace Engineering Trends 2025

Based on global industry analysis, the aerospace sector is experiencing transformative changes:

Sustainability and Green Technology

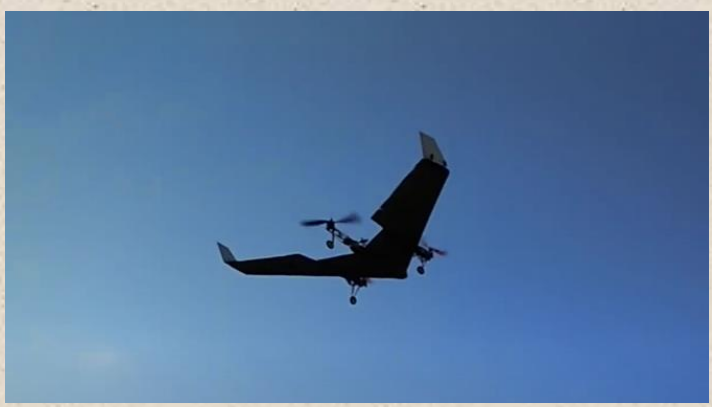
- **Electric and Hybrid Aircraft:** Prototypes undergoing test flights for short-haul and regional applications
- **Sustainable Aviation Fuels (SAFs):** Accelerated adoption reducing carbon emissions
- **Hydrogen Fuel Cell Integration:** Revolutionary propulsion systems for net-zero aviation

Digital Transformation

- **Artificial Intelligence:** 30% reduction in unscheduled maintenance events through AI-powered predictive systems
- **Digital Twin Technology:** Real-time monitoring and predictive maintenance capabilities
- **Additive Manufacturing:** 3D printing enabling lightweight, complex geometries previously unachievable

Advanced Air Mobility

- **eVTOL Technology:** Electric vertical takeoff and landing systems for urban mobility
- **Autonomous Systems:** AI-driven avionics and self-diagnosing systems
- **Smart Aircraft Systems:** Real-time performance monitoring and optimization



LOOKING AHEAD

Future Initiatives

- Expansion of research collaborations with international institutions
- Development of new courses in emerging aerospace technologies
- Enhanced industry-academia partnerships
- Advanced research in sustainable aviation technologies
- Increased focus on space technology applications
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Upcoming Events

- International symposium on aerospace innovations
- Industry-academia interface programs
- Advanced workshop series on emerging technologies
- Student research symposium

CONCLUSION

The March-September 2025 period has been exceptionally productive for our department, marked by significant research achievements, successful event organization, and continued excellence in academic pursuits. Our celebration of National Space Day particularly highlighted our connection to India's remarkable space program and our commitment to inspiring future generations of aerospace engineers.

As we move forward, we remain dedicated to our vision of excellence in aerospace education and research, contributing to India's technological advancement and global leadership in aerospace engineering. The successful completion of major research projects, impressive publication record, and active participation in national initiatives demonstrate our department's unwavering commitment to academic excellence and societal contribution.

We extend our gratitude to all faculty members, students, staff, and collaborators who made these achievements possible. Together, we continue to reach new heights in aerospace engineering education and research.

Closing Note

As we conclude this newsletter, I would like to take a moment to reflect on the extraordinary journey our department has undertaken during this transformative period. The achievements documented in these pages are not merely statistics or accomplishments – they represent the collective dreams, aspirations, and relentless efforts of our entire academic community.

Our celebration of National Space Day with the theme "Aryabhata to Gaganyaan" was particularly meaningful, as it reminded us of our rich heritage while inspiring us to reach for the stars. From the ancient wisdom of Aryabhata, who calculated the Earth's circumference with remarkable precision, to India's ambitious Gaganyaan mission that will carry our astronauts to space, we see the continuous thread of innovation and excellence that defines our nation's scientific spirit.

The research breakthroughs in computational fluid dynamics, the pioneering work in green propulsion systems, and our impressive publication record all contribute to a larger narrative – one where IIEST Shibpur continues to be a beacon of engineering excellence in India and beyond. Our faculty's participation in international collaborations, particularly the Indo-U.S. synergies initiative, demonstrates our commitment to global partnerships while remaining rooted in our cultural values and national priorities.

To our students, you are the future of aerospace engineering. The knowledge you gain here, the research you conduct, and the innovations you will create will shape the world of tomorrow. Whether you design the next generation of electric aircraft, contribute to India's space missions, or develop sustainable aviation technologies, remember that you carry with you the legacy of this prestigious institution.

To our alumni scattered across the globe, you remain an integral part of our family. Your success in academia, industry, and entrepreneurship continues to elevate our department's reputation and opens new opportunities for current students. We encourage you to stay connected with us and contribute to our ongoing mission of excellence.

As we look toward the future, we are excited about the possibilities that lie ahead. The aerospace industry is undergoing a revolutionary transformation with electric propulsion, autonomous systems, space commercialization, and sustainable aviation taking center stage. Our department is well-positioned to lead these changes, armed with cutting-edge research

capabilities, world-class faculty, and ambitious students.

In closing, I want to express my sincere appreciation to everyone who has contributed to making this newsletter possible – from those who organized events and conducted research to those who supported and encouraged our efforts. Your dedication and commitment are the driving forces behind our success.

Let us continue to dream big, work hard, and strive for excellence. The sky is not the limit; it is just the beginning of our journey into the infinite possibilities that aerospace engineering offers.

With gratitude and best wishes for continued success,

Prof. Rana Roy
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For more information about our department, programs, and research activities, please visit:

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