



7th International Conference on Energy, Power and Environment

May 09 – May 11, 2025



**Venue: National Institute of Technology Meghalaya,
Sohra Campus, India**

Website: <https://nitm.ac.in/icepe2025/>



ICEPE 2025 Special Session (SS-03)

Title of the special session

Advancements in Smart Materials and Structures for Sustainable Energy, Power, and Environmental Solutions

Aims and scope of the session

Bringing together researchers, engineers, and practitioners from academia, industry, and research organizations to discuss the most recent developments, innovations, and difficulties in the field of smart materials and structures is the main goal of this special session. The presentation will focus on the creation, advancement, and use of materials and structures that react intelligently to outside stimuli, providing novel approaches in a variety of industries, including robotics, aerospace, automotive, civil engineering, and biomedicine. The goal of the session is to promote cooperation and information sharing among experts in the fields of multifunctional composites, adaptive structures, and smart materials. The session will examine how smart materials and structures may transform a variety of sectors by improving performance, sustainability, and safety by presenting state-of-the-art research and practical implementations.

The topics of interest encompass (but not limited to)

- **Modeling, Simulation, and Design for Smart Sensors and Actuators**
 - ❖ Computational methods for smart material design
 - ❖ Multi-functional and multi-scale modeling
 - ❖ Optimization of smart structures
 - ❖ AI and machine learning in smart material design
- **Fabrication and Manufacturing Strategies for Smart Material and Structures**
 - ❖ Additive manufacturing of smart materials
 - ❖ Smart composites and hybrid materials
 - ❖ Fabrication techniques for responsive and adaptive structures
- **Smart Materials for Structural Health Monitoring**
 - ❖ Self-healing materials
 - ❖ Piezoelectric materials for strain sensing
 - ❖ Fiber optic sensors
 - ❖ Wireless sensor networks
 - ❖ Biomedical: Smart implants, prosthetics, bio-responsive materials
- **Actuation in Adaptive Structures**
 - ❖ Adaptive wings in aerospace
 - ❖ Shape-changing structures
 - ❖ Civil Engineering: Smart buildings, self-healing concrete, responsive infrastructures
 - ❖ Automotive: Intelligent vehicle systems, crash safety, energy-efficient materials

- **Smart Actuators**
 - ❖ Robotics: Soft robotics, shape-changing actuators
 - ❖ Medical devices (e.g., stents)
 - ❖ Aerospace: Morphing wings, bio-inspired actuators
- **Smart Materials in Energy Harvesting Systems**
 - ❖ Portable electronics,
 - ❖ Vibration damping systems,
 - ❖ Energy harvesting, storage systems, and energy-efficient materials
- **Nanomaterials for Sensing and Actuating in Microsystems**
 - ❖ Medical diagnostics,
 - ❖ Micro-robotics,
 - ❖ Nano-sensors for environmental monitoring.

Special Session Organizers

1. Dr. Ankur Gupta, Post Doctoral Fellow, IIT Guwahati – Technology Innovation & Development Foundation

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Dr. Ankur Gupta is currently working as Post Doctoral Fellow at IIT Guwahati – Technology Innovation & Development Foundation. He is currently working on project title “Technologies for Underwater Explorations” funded by DST under NM-ICPS. He has completed his PhD from PDPM IITDM Jabalpur with the thesis titled “Dynamic Modelling and Control of Biomimetic IPMC Underwater Propulsor”. He has completed his Masters from NIT Jalandhar in Manufacturing Technology. He has recently won the Best Paper Award for the Paper titled “Swimming Performance of a Ribbon Fin Inspired Biomimetic Underwater Propulsor Actuated by IPMC” in the 10th International Conference on Electronics, Computing and Communication Technologies, IEEE CONECCT (July 12-14, 2024) organized by IEEE Bangalore section at IISc Bangalore. He has published journals, conferences, and book chapters under smart materials and structures domain. His current areas of research are Smart Materials and Structures, System Modelling, Biomimetic Robotics, Automation & Robotics and Advanced & Intelligent Control Theory.



2. Dr. Moumita Tewary, Assistant Professor, Department of Mechanical Engineering, NIT Meghalaya

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Dr. Moumita Tewary is currently working as an Assistant Professor in the Department of Mechanical Engineering at NIT Meghalaya. She completed her PhD from NIT Rourkela with the thesis titled "Instability and Nonlinear Dynamic Analyses of Convex Bimorph Dielectric Elastomer Actuator for Soft Fish Robotic Tail." She pursued her Master's degree in Mechanical Engineering with a specialization in Machine Design from NIT Durgapur, where she graduated as the topper.

Dr. Tewary has a significant body of work published in journals, conferences, and book chapters, particularly in the domain of smart materials and structures. Her current areas of research focus on Nonlinear Dynamics, Electroactive Polymers, Dielectric Elastomers, and Soft Robots. She is also actively involved in a project titled "Nonlinear Dynamic Analysis and Development of Soft Fish Robot," where she serves as the Co-Principal Investigator. It is currently ongoing and aims to explore advanced dynamics and robotic applications in soft materials.

Through her academic and professional journey, Dr. Tewary has made noteworthy contributions to the fields of actuation mechanisms for underwater exploration and soft robotics.

