

Special Session Proposal

- **Session title**

Mathematics Without Boundaries: From Theory to Applications in Science and Engineering

- **General Information of Organizers**

Dr. Safia Akram (Main Contact Person)

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Affiliation: MCS, National University of Sciences and Technology, Pakistan

Biodata:

Dr. Safia Akram is a leading researcher and academic in applied mathematics, specializing in computational modeling, simulation, and control of complex fluid and dynamical systems. Her research bridges classical mathematical theory, numerical analysis, and modern AI-based techniques to investigate phenomena in biological, nanofluid, and non-Newtonian systems under intricate physical conditions.

Dr. Akram has extensive experience in modeling and simulating transport processes, including heat and mass transfer, peristaltic flow, magnetohydrodynamics, and entropy generation in nano-enhanced biofluids. She employs advanced methods such as finite element analysis, spectral methods, and physics-informed neural networks (PINNs) to develop predictive, high-fidelity models. Her work exemplifies “Mathematics Without Boundaries”, integrating control theory, simulation, and interdisciplinary applications to solve real-world problems in biomedical engineering, drug delivery, thermal therapy, and bio-microfluidic device design. By combining rigorous mathematical analysis with computational and AI-driven approaches, she contributes to developing adaptable, efficient, and realistic tools for the simulation and control of complex dynamical systems.

Dr. Akram has authored over 108 ISI-indexed publications and has been recognized among the World’s Top 2% Scientists by Stanford University in 2025, 2024, 2023, 2022. Her expertise makes her a prominent leader in the intersection of applied mathematics, control theory, and computational simulation, aligning perfectly with the goals of this special session.

Co-Organizer(s):

1. Dr. Maria Athar

Email: [maria.athar@seecs.edu.pk]

Affiliation: [Military College of Engineering, National University of Sciences and Technology, Pakistan]

2. Dr. Arshad Riaz

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Affiliation: Department of Mathematics, Division of Science and Technology,
University of Education, Lahore 54770, Pakistan

- **Brief description of special session**

Mathematics serves as the universal language of science and engineering, providing the foundational framework that connects abstract theory with practical applications. This special session, “Mathematics Without Boundaries: From Theory to Applications in Science and Engineering,” aims to showcase the latest advancements in both theoretical and applied mathematics, emphasizing their transformative role across multiple scientific and engineering disciplines. The session will highlight how theoretical developments in mathematics translate into practical tools for solving complex real-world problems.

The session will highlight how cutting-edge mathematical concepts—ranging from classical analysis, partial differential equations, and algebraic structures to modern computational methods, numerical simulations, and data-driven techniques—can be effectively applied to solve complex, real-world problems. It will focus on bridging the gap between rigorous mathematical theory and tangible applications in areas such as fluid dynamics, materials science, engineering design, environmental modeling, control theory, cryptography, mathematical biology, and physical systems. The session will serve as a platform for researchers from academia and industry to exchange ideas, present recent findings, and foster interdisciplinary collaboration.

Topics will range from fundamental mathematical theories to innovative applications, reflecting the theme of “mathematics without boundaries” in addressing modern scientific challenges.

- **Related Topics**

- Computational modeling and simulation of dynamical systems
- Linear, nonlinear, stochastic, and adaptive control systems
- Data-Driven and Machine Learning Methods in Simulation
- Multiphysics and Multiscale Modeling
- Optimal and robust control methods
- Networked and distributed control systems
- Applications in engineering, technology, biology, and economics
- Interdisciplinary approaches connecting mathematics with real-world challenges

- **Potential Participants**

The session will target:

- Practitioners implementing mathematical methods in technological and scientific applications
- Biomedical engineers working on fluid-related systems
- Scholars in control theory and optimization
- Industry professionals in automation, aerospace, and systems engineering

- Graduate and postgraduate students in interdisciplinary fields, control theory, simulation, and applied mathematics
- Researchers in pure and applied mathematics (PDEs, analysis, dynamical systems)
- Academic researchers in computational physics, applied mathematics, and engineering
- Industry professionals working in simulation, modeling, and design
- Postdoctoral researchers and graduate students
- Experts in CFD, numerical analysis, and scientific computing
- Potential contributors may come from universities, research institutes, and industrial R&D sectors worldwide.

- **Description of Publicity and Promotion Plan**

To ensure high-quality submissions and broad participation, the session will be promoted through:

- Distribution of the call for papers via academic mailing lists and research networks
- Direct invitations to leading researchers and previous collaborators
- Direct invitations to researchers in relevant fields
- Promotion through professional platforms such as LinkedIn and ResearchGate
- Sharing within relevant university departments and research groups
- Coordination with conference organizers to feature the session on the official website
- Online platforms and institutional newsletters to reach a global audience
- Personal invitations to leading researchers and practitioners

Additionally, the organizers will actively encourage submissions from early-career researchers and international participants to ensure diversity and inclusivity.