Stochastic Mechanics

Organizers

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Scope and Objectives

The safe design, performance, and long-term integrity of critical engineering systems—ranging from aerospace and energy infrastructure to advanced manufacturing—depend directly on the realistic behavior of materials and structures. In operational environments, structural response is continuously governed by intrinsic uncertainties, including microstructure variability, stochastic dynamic loading, geometric tolerances, and harsh environmental degradation. Deterministic models frequently fall short, leading either to excessive material conservatism or dangerously underestimated failure risks.

This mini-symposium aims to bridge theoretical advances and engineering applications in stochastic mechanics and uncertainty quantification. We invite contributions addressing the full spectrum of uncertainty modeling, propagation, and mitigation. Relevant scopes include novel probabilistic and multi-scale constitutive frameworks, advanced computational methods (such as stochastic finite elements, surrogate modeling, and machine learning), dynamic response and extreme event analysis, as well as reliability-based optimization and life-cycle prognosis. We warmly welcome interdisciplinary studies combining theoretical, computational, and experimental perspectives across aerospace, civil, mechanical, and materials engineering.

Keywords: Stochastic Mechanics, Artificial Intelligence, Uncertainty Quantification, Structural Reliability, Surrogate Modeling, Stochastic Dynamics.