# Towards the Next Generation of Smart Structures

Mariantonieta Gutierrez Soto[*1]

[1]University of Kentucky (UKy) – Lexington, KY 40506-0046, USA, United States

## Abstract

Physical infrastructure subjected to and interacting with the environment requires innovative solutions from *normal* operating conditions, to intermediate stress conditions (i.e. deterioration, severe climate conditions, etc.) and to extreme conditions (e.g. natural and man-made hazards). From sustainable and energy considerations during normal operating conditions to the protection of structures in the face of extreme single or multiple hazard events is a critical and complex issue faced by engineers. To tackle this problem, several innovations are being developed, such as: (1) smart structures, which are designed and instrumented with multifunctional components to integrate sensing, control, and actuation within the structural system, (2) adaptive structures, which can alter their configurations and/or properties to better respond to changes in the environment, and (3) bio-inspired building systems, which mimic natural habitats and/or physiological systems to achieve better performance. However, these advanced types of structures introduce a new series of complexities and require further progress in the fundamental understanding of dynamic response, vibration reduction, life-cycle analysis and risk mitigation of structures subjected to single and multiple hazard events. This minisymposium (MS) provides an opportunity to engineers and researchers to present current findings in dynamic response analysis methods and techniques in risk mitigation of structures subjected to and interacting with the natural environment to meet the needs of humans. This session welcomes studies using conceptual, theoretical, computational, and/or methodological approaches in the analysis of dynamic response, active/passive/hybrid vibration control, and risk assessment/mitigation for advanced structures (as well as ordinary structures equipped with advanced sub-systems) using novel, real-world case studies and/or large-scale applications. While the MS has a predominant focus on civil structures, applications in other engineering fields such as mechanical, electrical, aerospace and materials science and engineering are also welcomed.

**Keywords:** smart structures, hazards, resilience, vibration control, energy, sustainability

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[*]Speaker