Mathematical Problems in Engineering

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Special Issue on

Computer-aided Structural Integrity and Reliability Analysis of Power and Energy Systems

CALL FOR PAPERS

To ensure the safety and reliability of power and energy systems, such as wind turbines, gas/steam turbines, or power plants, developing computer-aided structural integrity and reliability assessment of engineering structures and systems is essential. For many countries, such as the UK and the USA, which are currently facing a potential future mismatch between energy production and transformation, increasing attention is being paid to new techniques to discover and understand the integrity and reliability of engineering structures and systems. Due to unexpected ageing and related degradations/damaging, mechanical properties, microstructures, and structural resistance of systems often require stochastic considerations related to failure modelling and analysis. In addition, various sources of uncertainty/variability arising from a simplied representation of the actual physical process (often through semi-empirical or empirical models) and/or sparse information on manufacturing, material properties, and loading proles, contributes to the stochastic behaviour under operations.

As the next generation of power and energy systems develop, continued improvements in the structural integrity and reliability of these systems have been possible through the accurate modelling of multi-physics failures, and the introduction of advanced processing approaches. These are based on either deterministic or probabilistic analyses using computer methods, such as artificial intelligence, evolutionary computing, fuzzy logic, genetic algorithms, geometric modelling, intelligent and adaptive systems, knowledge discovery and engineering, machine learning, neural network computing, and optimization and search. Based on Physics-of-Failure (PoF)-based and data-driven-based approaches, researches on reliability and performance degradation assessment should be conducted to maximize the lifetime and optimize the inspection and maintenance policy of power and energy systems. Specifically, failure occurs under influences of multi-sources of uncertainty, including load variations in usage, material properties, geometry variations within tolerances, and other uncontrolled variations (such as environmental factors). Thus, advanced methods for theoretical and numerical contributions that address these issues on structural integrity and reliability assessment of power are energy systems are desired and expected.

The aim of this Special Issue is to establish a common understanding about the state of the field and draw a road map on where the research is heading, highlighting the issues and discussing the possible solutions, and to provide the data, models and tools necessary to perform statistically reliability and integrity assessment by computer methods. We welcome both original research and review articles that will support and stimulate the continuing efforts to understand the research and development of PoF-based modelling and data-driven-based approaches for structural integrity, reliability and field applications.

Potential topics include but are not limited to the following:

- Artificial intelligence
- Fuzzy logic and genetic algorithms
- Machine learning
- Neural network computing
- Structural integrity
- Structural reliability
- Failure mechanisms
- Prognostics and health management
- Probabilistic physics of failure
- Reliability-based design
- Durability and damage tolerance
- Uncertainty quantification and propagation
- Performance degradation modelling and analysis

Authors can submit their manuscripts through the Manuscript Tracking System at https://review.hindawi.com/submit?specialIssue=190439.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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