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Uncertainty Modeling for Engineering Applications



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Editor

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Preface

The systematic quantification of the uncertainties affecting physical systems is critical for engineering design and analysis, where risks must be reduced as much as possible. Uncertainties stem naturally from the limited availability or accuracy of data, from the approximations in modeling or the adequacy of mathematical predictions, and from the limited precision of computational processing.

Determining appropriate ways and methods of dealing with uncertainty has been a constant challenge. Recently, research has significantly progressed to develop algorithms for multi-scale and multi-physics applications based on the development of stochastic expansions, on surrogate models, and on the quantification of prediction uncertainty.

This book, with invited chapters, deals with the uncertainty phenomena in diverse fields. The book collects several extended contributions of presentations delivered at the Workshop on Uncertainty Modeling for Engineering Applications (UMEMA), which was held at the Politecnico di Torino (Valentino Castle), Torino, Italy, in November 2017. The workshop brought together renowned scientists from different sectors, including aerospace and mechanical applications, structure health and seismic hazard, electromagnetic energy (its impact on systems and humans) and global environmental state change, with the scope of sharing their experiences, best practices and future challenges in Uncertainty Quantification (UQ) applications. The main objective of this book is to demonstrate the unifying property of the UQ theme that can be profitably adopted to solve problems of different domains. The collection in one book of different methodologies for different applications intends to stimulate the cross-fertilization and alleviate the language barrier among areas sharing a common background of mathematical modeling for the solution of their problems.

Turin, Italy

Flavio Canavero

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