

Preface

Reliability and safety analyses are important applications of modern probabilistic methods and stochastic concept (reliability of systems, probability of failure, statistics, and random variables/processes). These fields create a wide range of problems but due to their practical importance, it gave rise to development of new probabilistic methods and can contain interesting and fruitful mathematical settings. The reliability of a structure is traditionally achieved by deterministic methods using safety factors calculated generally under conservative estimators of influent parameters. Structural reliability analysis methods use probabilistic approaches for assessing safety factors or for optimizing maintenance and inspection programs. These methods become essential in the frame of long-term maintenance or life extension.

The main focus of this book is numerical methods for multiscale and multiphysics in reliability and safety. Multiphysics problems are problems involving two or more equations describing different physical phenomena that are coupled together via the equations. Multiscale problems on the other hand are problems on large scales that experience fine scale behavior, which makes them hard to solve using standard methods. Instead of solving the entire problem at once the problem is rewritten into many smaller subproblems that are coupled from each other.

This book includes 29 chapters, contributed by worldwide researchers and practitioners from 16 countries, of innovative concepts, theories, techniques, and engineering applications in various fields. It is designed to assist practicing engineers, students, and researchers in the areas of reliability engineering, safety and risk analysis.

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