Preface

This textbook serves as an introduction to fault tolerance, intended for upper division undergraduate students, graduate-level students, and practicing engineers in need of an overview of the field. Readers will develop skills in modeling and evaluating fault-tolerant architectures in terms of reliability, availability, and safety. They will gain a thorough understanding of fault-tolerant computing, including both the theory of how to achieve fault tolerance through hardware, software, information, and time redundancy and the practical knowledge of designing fault-tolerant hardware and software systems.

The book contains eight chapters covering the following topics. Chapter 1 is an introduction, discussing the importance of fault tolerance in developing a dependable system. Chapter 2 describes three fundamental characteristics of dependability: attributes, impairment, and means. Chapter 3 introduces dependability evaluation techniques and dependability models such as reliability block diagrams and Markov chains. Chapter 4 presents commonly used approaches for the design of fault-tolerant hardware systems, such as triple modular redundancy, standby redundancy, and self-purging redundancy and evaluates their effect on system dependability. Chapter 5 shows how fault tolerance can be achieved by means of coding. It covers many important families of codes, including parity, linear, cyclic, unordered, and arithmetic codes. Chapter 6 presents time redundancy techniques which can be used for detecting and correcting transient and permanent faults. Chapter 7 describes the main approaches for the design of fault-tolerant software systems, including checkpoint and restart, recovery blocks, N-version programming, and N self-checking programming. Chapter 8 concludes the book.

The content is designed to be highly accessible, including numerous examples and problems to reinforce the material learned. Solutions to problems and PowerPoint slides are available from the author upon request.

Stockholm, Sweden, December 2012

Elena Dubrova
Fault-Tolerant Design
Dubrova, E.
2013, XV, 185 p., Hardcover