

# 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 Power-Point slides are available from the author upon request.

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