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PREFACE

Digital systems are created to perform data processing and control tasks. What distinguishes one system from another is an architecture tailored to efficiently execute the tasks for which it was designed. A desktop computer and an automobile's engine controller have markedly different attributes dictated by their unique requirements. Despite these differences, they share many fundamental building blocks and concepts. Fundamental to digital system design is the ability to choose from and apply a wide range of technologies and methods to develop a suitable system architecture. Digital electronics is a field of great breadth, with interdependent topics that can prove challenging for individuals who lack previous hands-on experience in the field.

This book's focus is explaining the real-world implementation of complete digital systems. In doing so, the reader is prepared to immediately begin design and implementation work without being left to wonder about the myriad ancillary topics that many texts leave to independent and sometimes painful discovery. A complete perspective is emphasized, because even the most elegant computer architecture will not function without adequate supporting circuits.

A wide variety of individuals are intended to benefit from this book. The target audiences include

- *Practicing electrical engineers seeking to sharpen their skills in modern digital system design.* Engineers who have spent years outside the design arena or in less-than-cutting-edge areas often find that their digital design skills are behind the times. These professionals can acquire directly relevant knowledge from this book's practical discussion of modern digital technologies and design practices.
- *College graduates and undergraduates seeking to begin engineering careers in digital electronics.* College curricula provide a rich foundation of theoretical understanding of electrical principles and computer science but often lack a practical presentation of how the many pieces fit together in real systems. Students may understand conceptually how a computer works while being incapable of actually building one on their own. This book serves as a bridge to take readers from the theoretical world to the everyday design world where solutions must be complete to be successful.
- *Technicians and hobbyists seeking a broad orientation to digital electronics design.* Some people have an interest in understanding and building digital systems without having a formal engineering degree. Their need for practical knowledge in the field is as strong as for degreed engineers, but their goals may involve laboratory support, manufacturing, or building a personal project.

There are four parts to this book, each of which addresses a critical set of topics necessary for successful digital systems design. The parts may be read sequentially or in arbitrary order, depending on the reader's level of knowledge and specific areas of interest.

A complete discussion of digital logic and microprocessor fundamentals is presented in the first part, including introductions to basic memory and communications architectures. More advanced computer architecture and logic design topics are covered in Part 2, including modern microprocessor architectures, logic design methodologies, high-performance memory and networking technologies, and programmable logic devices.