

## Advanced Chip Design Practical Examples In Verilog

With Bluetooth Low Energy (BLE), smart devices are about to become even smarter. This practical guide demonstrates how this exciting wireless technology helps developers build mobile apps that share data with external hardware, and how hardware engineers can gain easy and reliable access to mobile operating systems. This book provides a solid, high-level overview of how devices use BLE to communicate with each other. You'll learn useful low-cost tools for developing and testing BLE-enabled mobile apps and embedded firmware and get examples using various development platforms—including iOS and Android for app developers and embedded platforms for product designers and hardware engineers. Understand how data is organized and transferred by BLE devices Explore BLE's concepts, key limitations, and network topology Dig into the protocol stack to grasp how and why BLE operates Learn how BLE devices discover each other and establish secure connections Set up the tools and infrastructure for BLE application development Get examples for connecting BLE to iPhones, iPads, Android devices, and sensors Develop code for a simple device that transmits heart rate data to a mobile device

This book provides a comprehensive overview of the VLSI design process. It covers end-to-end system on chip (SoC) design, including design methodology, the design environment, tools, choice of design components, handoff procedures, and design infrastructure needs. The book also offers critical guidance on the latest UPF-based low power design flow issues for deep submicron SOC designs, which will prepare readers for the challenges of working at the nanotechnology scale. This practical guide will provide

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engineers who aspire to be VLSI designers with the techniques and tools of the trade, and will also be a valuable professional reference for those already working in VLSI design and verification with a focus on complex SoC designs. A comprehensive practical guide for VLSI designers; Covers end-to-end VLSI SoC design flow; Includes source code, case studies, and application examples.

This book provides a unified overview of network-on-chip router micro-architecture, the corresponding design opportunities and challenges, and existing solutions to overcome these challenges. The discussion focuses on the heart of a NoC, the NoC router, and how it interacts with the rest of the system. Coverage includes both basic and advanced design techniques that cover the entire router design space including router organization, flow control, pipelined operation, buffering architectures, as well as allocators' structure and algorithms. Router micro-architectural options are presented in a step-by-step manner beginning from the basic design principles. Even highly sophisticated design alternatives are categorized and broken down to simpler pieces that can be understood easily and analyzed. This book is an invaluable reference for system, architecture, circuit, and EDA researchers and developers, who are interested in understanding the overall picture of NoC routers' architecture, the associated design challenges, and the available solutions.

Intelligent readers who want to build their own embedded computer systems-- installed in everything from cell phones to cars to handheld organizers to refrigerators-- will find this book to be the most in-depth, practical, and up-to-date guide on the market. Designing Embedded Hardware carefully steers between the practical and philosophical aspects, so developers can both create their own devices and gadgets and customize and extend off-the-shelf systems. There are

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hundreds of books to choose from if you need to learn programming, but only a few are available if you want to learn to create hardware. Designing Embedded Hardware provides software and hardware engineers with no prior experience in embedded systems with the necessary conceptual and design building blocks to understand the architectures of embedded systems. Written to provide the depth of coverage and real-world examples developers need, Designing Embedded Hardware also provides a road-map to the pitfalls and traps to avoid in designing embedded systems.

Designing Embedded Hardware covers such essential topics as: The principles of developing computer hardware Core hardware designs Assembly language concepts Parallel I/O Analog-digital conversion Timers (internal and external) UART Serial Peripheral Interface Inter-Integrated Circuit Bus Controller Area Network (CAN) Data Converter Interface (DCI) Low-power operation This invaluable and eminently useful book gives you the practical tools and skills to develop, build, and program your own application-specific computers. This is a practical book for computer engineers who want to understand or implement hardware/software systems. It focuses on problems that require one to combine hardware design with software design – such problems can be solved with hardware/software codesign. When used properly, hardware/software co- sign works better than hardware design or software design alone: it can improve the overall performance of digital systems, and it can shorten their design time. Hardware/software codesign can help a designer to make trade-offs between the ?exibility and the performance of a digital system. To achieve this, a designer needs to combine two radically different ways of design: the sequential way of decomposition in time, using software, with the parallel way of decomposition in space, using hardware. Intended Audience This book assumes that you have a basic

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understanding of hardware that you are familiar with standard digital hardware components such as registers, logic gates, and components such as multiplexers and arithmetic operators. The book also assumes that you know how to write a program in C. These topics are usually covered in an introductory course on computer engineering or in a combination of courses on digital design and software engineering.

The authors present readers with a compelling, one-stop, advanced system perspective on the intrinsic issues of digital system design. This invaluable reference prepares readers to meet the emerging challenges of the device and circuit issues associated with deep submicron technology. It incorporates future trends with practical, contemporary methodologies. Understand the fundamentals and develop your own AI solutions in this updated edition packed with many new examples

**Key Features**

- AI-based examples to guide you in designing and implementing machine intelligence
- Build machine intelligence from scratch using artificial intelligence examples
- Develop machine intelligence from scratch using real artificial intelligence

**Book Description**

AI has the potential to replicate humans in every field. *Artificial Intelligence By Example, Second Edition* serves as a starting point for you to understand how AI is built, with the help of intriguing and exciting examples. This book will make you an adaptive thinker and help you apply concepts to real-world scenarios. Using some of the most interesting AI examples, right from computer programs such as a simple chess engine to cognitive chatbots, you will learn how to tackle the machine you are competing with. You will study some of the most advanced machine learning models, understand how to apply AI to blockchain and Internet of Things (IoT), and develop emotional quotient in chatbots using neural networks such as recurrent neural networks (RNNs) and convolutional neural

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networks (CNNs). This edition also has new examples for hybrid neural networks, combining reinforcement learning (RL) and deep learning (DL), chained algorithms, combining unsupervised learning with decision trees, random forests, combining DL and genetic algorithms, conversational user interfaces (CUI) for chatbots, neuromorphic computing, and quantum computing. By the end of this book, you will understand the fundamentals of AI and have worked through a number of examples that will help you develop your AI solutions. What you will learn

- Apply k-nearest neighbors (KNN) to language translations and explore the opportunities in Google Translate
- Understand chained algorithms combining unsupervised learning with decision trees
- Solve the XOR problem with feedforward neural networks (FNN) and build its architecture to represent a data flow graph
- Learn about meta learning models with hybrid neural networks
- Create a chatbot and optimize its emotional intelligence deficiencies with tools such as Small Talk and data logging
- Building conversational user interfaces (CUI) for chatbots
- Writing genetic algorithms that optimize deep learning neural networks
- Build quantum computing circuits

Who this book is for  
Developers and those interested in AI, who want to understand the fundamentals of Artificial Intelligence and implement them practically. Prior experience with Python programming and statistical knowledge is essential to make the most out of this book.

This comprehensive and insightful book discusses ESD protection circuit design problems from an IC designer's perspective. *On-Chip ESD Protection for Integrated Circuits: An IC Design Perspective* provides both fundamental and advanced materials needed by a circuit designer for designing ESD protection circuits, including: Testing models and standards adopted by U.S. Department of Defense, EIA/JEDEC, ESD Association, Automotive Electronics

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Council, International Electrotechnical Commission, etc. ESD failure analysis, protection devices, and protection of sub-circuits Whole-chip ESD protection and ESD-to-circuit interactions Advanced low-parasitic compact ESD protection structures for RF and mixed-signal IC's Mixed-mode ESD simulation-design methodologies for design prediction ESD-to-circuit interactions, and more! Many real world ESD protection circuit design examples are provided. The book can be used as a reference book for working IC designers and as a textbook for students in the IC design field.

In April 1991 BusinessWeek ran a cover story entitled, "Can't Work This #@! Thing," about the difficulties many people have with consumer products, such as cell phones and VCRs. More than 15 years later, the situation is much the same-but at a very different level of scale. The disconnect between people and technology has had society-wide consequences in the large-scale system accidents from major human error, such as those at Three Mile Island and in Chernobyl. To prevent both the individually annoying and nationally significant consequences, human capabilities and needs must be considered early and throughout system design and development. One challenge for such consideration has been providing the background and data needed for the seamless integration of humans into the design process from various perspectives: human factors engineering, manpower, personnel, training, safety and health, and, in the military, habitability and survivability. This collection of development activities has come to be called human-system integration (HSI). Human-System Integration in the System Development Process reviews in detail more than 20 categories of HSI methods to provide invaluable guidance and information for system designers and developers.

This book is a comprehensive guide to new DFT methods

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that will show the readers how to design a testable and quality product, drive down test cost, improve product quality and yield, and speed up time-to-market and time-to-volume. Most up-to-date coverage of design for testability. Coverage of industry practices commonly found in commercial DFT tools but not discussed in other books. Numerous, practical examples in each chapter illustrating basic VLSI test principles and DFT architectures.

This book provides the advanced issues of FPGA design as the underlying theme of the work. In practice, an engineer typically needs to be mentored for several years before these principles are appropriately utilized. The topics that will be discussed in this book are essential to designing FPGA's beyond moderate complexity. The goal of the book is to present practical design techniques that are otherwise only available through mentorship and real-world experience. One of the biggest challenges in chip and system design is determining whether the hardware works correctly. That is the job of functional verification engineers and they are the audience for this comprehensive text from three top industry professionals. As designs increase in complexity, so has the value of verification engineers within the hardware design team. In fact, the need for skilled verification engineers has grown dramatically--functional verification now consumes between 40 and 70% of a project's labor, and about half its cost. Currently there are very few books on verification for engineers, and none that cover the subject as comprehensively as this text. A key strength of this book is that it describes the entire verification cycle and details each stage. The organization of the book follows the cycle, demonstrating how functional verification engages all aspects of the overall design effort and how individual cycle stages relate to the larger design process. Throughout the text, the authors leverage their 35 plus years experience in functional

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verification, providing examples and case studies, and focusing on the skills, methods, and tools needed to complete each verification task. Comprehensive overview of the complete verification cycle Combines industry experience with a strong emphasis on functional verification fundamentals Includes real-world case studies

Praise for the first edition: "This excellent text will be useful to every system engineer (SE) regardless of the domain. It covers ALL relevant SE material and does so in a very clear, methodical fashion. The breadth and depth of the author's presentation of SE principles and practices is outstanding."

—Philip Allen This textbook presents a comprehensive, step-by-step guide to System Engineering analysis, design, and development via an integrated set of concepts, principles, practices, and methodologies. The methods presented in this text apply to any type of human system -- small, medium, and large organizational systems and system development projects delivering engineered systems or services across multiple business sectors such as medical, transportation, financial, educational, governmental, aerospace and defense, utilities, political, and charity, among others. Provides a common focal point for "bridging the gap" between and unifying System Users, System Acquirers, multi-discipline System Engineering, and Project, Functional, and Executive Management education, knowledge, and decision-making for developing systems, products, or services Each chapter provides definitions of key terms, guiding principles, examples, author's notes, real-world examples, and exercises, which highlight and reinforce key SE&D concepts and practices Addresses concepts employed in Model-Based Systems Engineering (MBSE), Model-Driven Design (MDD), Unified Modeling Language (UMLTM) / Systems Modeling Language (SysMLTM), and Agile/Spiral/V-Model Development such as user needs, stories, and use cases analysis;

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specification development; system architecture development; User-Centric System Design (UCSD); interface definition & control; system integration & test; and Verification & Validation (V&V) Highlights/introduces a new 21st Century Systems Engineering & Development (SE&D) paradigm that is easy to understand and implement. Provides practices that are critical staging points for technical decision making such as Technical Strategy Development; Life Cycle requirements; Phases, Modes, & States; SE Process; Requirements Derivation; System Architecture Development, User-Centric System Design (UCSD); Engineering Standards, Coordinate Systems, and Conventions; et al. Thoroughly illustrated, with end-of-chapter exercises and numerous case studies and examples, Systems Engineering Analysis, Design, and Development, Second Edition is a primary textbook for multi-discipline, engineering, system analysis, and project management undergraduate/graduate level students and a valuable reference for professionals.

Resistance and capacitance (RC) extraction is an essential step in modeling the interconnection wires and substrate coupling effect in nanometer-technology integrated circuits (IC). The field-solver techniques for RC extraction guarantee the accuracy of modeling, and are becoming increasingly important in meeting the demand for accurate modeling and simulation of VLSI designs. Advanced Field-Solver Techniques for RC Extraction of Integrated Circuits presents a systematic introduction to, and treatment of, the key field-solver methods for RC extraction of VLSI interconnects and substrate coupling in mixed-signal ICs. Various field-solver techniques are explained in detail, with real-world examples to illustrate the advantages and disadvantages of each algorithm. This book will benefit graduate students and researchers in the field of electrical and computer engineering as well as engineers working in the IC design and design

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automation industries. Dr. Wenjian Yu is an Associate Professor at the Department of Computer Science and Technology at Tsinghua University in China; Dr. Xiren Wang is a R&D Engineer at Cadence Design Systems in the USA. What if you could use software to design hardware? Not just any hardware--imagine specifying the behavior of a complex parallel computer, sending it to a chip, and having it run on that chip--all without any manufacturing? With Field-Programmable Gate Arrays (FPGAs), you can design such a machine with your mouse and keyboard. When you deploy it to the FPGA, it immediately takes on the behavior that you defined. Want to create something that behaves like a display driver integrated circuit? How about a CPU with an instruction set you dreamed up? Or your very own Bitcoin miner You can do all this with FPGAs. Because you're not writing programs--rather, you're designing a chip whose sole purpose is to do what you tell it--it's faster than anything you can do in code. With Make: FPGAs, you'll learn how to break down problems into something that can be solved on an FPGA, design the logic that will run on your FPGA, and hook up electronic components to create finished projects. Designing a complex ASIC/SoC is similar to learning a new language to start with and ultimately creating a masterpiece using experience, imagination, and creativity. Digital design starts with RTL such as Verilog or VHDL, but it is only the beginning. A complete designer needs to have a good understanding of the Verilog language, digital design techniques, system architecture, IO protocols, and hardware-software interaction. Some of it will come from experience, and some will come with concerted effort. Graduating from college and entering into the world of digital system design becomes an overwhelming task, as not all the information is readily available. In this book, we have made an effort to explain the concepts in a simple way with real-world

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examples in Verilog. The book is intended for digital and system design engineers with emphasis on design and system architecture. The book is broadly divided into two sections - chapters 1 through 10, focusing on the digital design aspects and chapters 11 through 20, focusing on the system aspects of chip design. This book can be used by students taking digital design and chip design courses in college and availing it as a guide in their professional careers. Chapter 3 focuses on the synthesizable Verilog constructs, with examples on reusable design (parameterized design, functions, and generate structure). Chapter 5 describes the basic concepts in digital design - logic gates, truth table, De Morgan's theorem, set-up and hold time, edge detection, and number system. Chapter 6 goes into details of digital design explaining larger building blocks such as LFSR, scrambler/descramblers, error detection and correction, parity, CRC, Gray encoding/decoding, priority encoders, 8b/10b encoding, data converters, and synchronization techniques. Chapter 7 and 8 bring in advanced concepts in chip design and architecture - clocking and reset strategy, methods to increase throughput and reduce latency, flow-control mechanisms, pipeline operation, out-of-order execution, FIFO design, state machine design, arbitration, bus interfaces, linked list structure, and LRU usage and implementation. Chapter 9 and 10 describe how to build and design ASIC/SoC. It talks about chip micro-architecture, portioning, datapath, control logic design, and other aspects of chip design such as clock tree, reset tree, and EEPROM. It also covers good design practices, things to avoid and adopt, and best practices for high-speed design. The second part of the book is devoted to System architecture, design, and IO protocols. Chapter 11 talks about memory, memory hierarchy, cache, interrupt, types of DMA and DMA operation. There is Verilog RTL for a typical DMA controller design that explains

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the scatter-gather DMA concept. Chapter 12 describes hard drive, solid-state drive, DDR operation, and other parts of a system such as BIOS, OS, drivers, and their interaction with hardware. Chapter 13 describes embedded systems and internal buses such as AHB, AXI used in embedded design. It describes the concept of transparent and non-transparent bridging. Chapter 14 and chapter 15 bring in practical aspects of chip development - testing, DFT, scan, ATPG, and detailed flow of the chip development cycle (Synthesis, Static timing, and ECO). Chapter 16 and chapter 17 are on power saving and power management protocols. Chapter 16 has a detailed description of various power savings techniques (frequency variation, clock gating, and power well isolation). Chapter 17 talks about Power Management protocols such as system S states, CPU C states, and device D states. Chapter 18 explains the architecture behind serial-bus technology, PCS, and PMA layer. It describes clocking architecture and advanced concepts such as elasticity FIFO, channel bonding (deskewing), link aggregation, and lane reversal. Chapter 19 and 20 are devoted to serial bus protocols (PCI Express, Serial ATA, USB, Thunderbolt, and Ethernet) and their operation.

A practical primer for the student and practicing engineer already familiar with the basics of digital design, the reference develops a working grasp of the verilog hardware description language step-by-step using easy-to-understand examples. Starting with a simple but workable design sample, increasingly more complex fundamentals of the language are introduced until all major features of verilog are brought to light. Included in the coverage are state machines, modular design, FPGA-based memories, clock management, specialized I/O, and an introduction to techniques of simulation. The goal

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is to prepare the reader to design real-world FPGA solutions. All the sample code used in the book is available online. What Strunk and White did for the English language with "The Elements of Style," VERILOG BY EXAMPLE does for FPGA design. Advanced Chip Design Practical Examples in Verilog Createspace Independent Pub

This book describes RTL design using Verilog, synthesis and timing closure for System On Chip (SOC) design blocks. It covers the complex RTL design scenarios and challenges for SOC designs and provides practical information on performance improvements in SOC, as well as Application Specific Integrated Circuit (ASIC) designs. Prototyping using modern high density Field Programmable Gate Arrays (FPGAs) is discussed in this book with the practical examples and case studies. The book discusses SOC design, performance improvement techniques, testing and system level verification, while also describing the modern Intel FPGA/XILINX FPGA architectures and their use in SOC prototyping. Further, the book covers the Synopsys Design Compiler (DC) and Prime Time (PT) commands, and how they can be used to optimize complex ASIC/SOC designs. The contents of this book will be useful to students and professionals alike.

Timing, timing, timing! That is the main concern of a digital designer charged with designing a semiconductor chip. What is it, how is it described, and how does one verify it? The design team of a large digital design may spend months architecting and iterating the design to achieve the required timing target. Besides functional verification,

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the timing closure is the major milestone which dictates when a chip can be released to the semiconductor foundry for fabrication. This book addresses the timing verification using static timing analysis for nanometer designs. The book has originated from many years of our working in the area of timing verification for complex nanometer designs. We have come across many design engineers trying to learn the background and various aspects of static timing analysis. Unfortunately, there is no book currently available that can be used by a working engineer to get acquainted with the details of static timing analysis. The chip designers lack a central reference for information on timing, that covers the basics to the advanced timing verification procedures and techniques.

This book concentrates on common classes of hardware architectures and design problems, and focuses on the process of transitioning design requirements into synthesizable HDL code. Using his extensive, wide-ranging experience in computer architecture and hardware design, as well as in his training and consulting work, Ben provides numerous examples of real-life designs illustrated with VHDL and Verilog code. This code is shown in a way that makes it easy for the reader to gain a greater understanding of the languages and how they compare. All code presented in the book is included on the companion CD, along with other information, such as application notes.

Field Programmable Gate Arrays (FPGAs) are currently recognized as the most suitable platform for the implementation of complex digital systems targeting an

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increasing number of industrial electronics applications. They cover a huge variety of application areas, such as: aerospace, food industry, art, industrial automation, automotive, biomedicine, process control, military, logistics, power electronics, chemistry, sensor networks, robotics, ultrasound, security, and artificial vision. This book first presents the basic architectures of the devices to familiarize the reader with the fundamentals of FPGAs before identifying and discussing new resources that extend the ability of the devices to solve problems in new application domains. Design methodologies are discussed and application examples are included for some of these domains, e.g., mechatronics, robotics, and power systems.

Here is an extremely useful book that provides insight into a number of different flavors of processor architectures and their design, software tool generation, implementation, and verification. After a brief introduction to processor architectures and how processor designers have sometimes failed to deliver what was expected, the authors introduce a generic flow for embedded on-chip processor design and start to explore the vast design space of on-chip processing. The authors cover a number of different types of processor core.

This book introduces a modern approach to embedded system design, presenting software design and hardware design in a unified manner. It covers trends and challenges, introduces the design and use of single-purpose processors ("hardware") and general-purpose processors ("software"), describes memories and buses, illustrates hardware/software tradeoffs using a digital

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camera example, and discusses advanced computation models, controls systems, chip technologies, and modern design tools. For courses found in EE, CS and other engineering departments.

Why is it so hard to make lasting changes in our companies, in our communities, and in our own lives? The primary obstacle is a conflict that's built into our brains, say Chip and Dan Heath, authors of the critically acclaimed bestseller *Made to Stick*. Psychologists have discovered that our minds are ruled by two different systems - the rational mind and the emotional mind—that compete for control. The rational mind wants a great beach body; the emotional mind wants that Oreo cookie. The rational mind wants to change something at work; the emotional mind loves the comfort of the existing routine. This tension can doom a change effort - but if it is overcome, change can come quickly. In *Switch*, the Heaths show how everyday people - employees and managers, parents and nurses - have united both minds and, as a result, achieved dramatic results:

- The lowly medical interns who managed to defeat an entrenched, decades-old medical practice that was endangering patients
- The home-organizing guru who developed a simple technique for overcoming the dread of housekeeping
- The manager who transformed a lackadaisical customer-support team into service zealots by removing a standard tool of customer service

In a

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compelling, story-driven narrative, the Heaths bring together decades of counterintuitive research in psychology, sociology, and other fields to shed new light on how we can effect transformative change.

Switch shows that successful changes follow a pattern, a pattern you can use to make the changes that matter to you, whether your interest is in changing the world or changing your waistline.

Digital Design and Computer Architecture: ARM Edition covers the fundamentals of digital logic design and reinforces logic concepts through the design of an ARM microprocessor. Combining an engaging and humorous writing style with an updated and hands-on approach to digital design, this book takes the reader from the fundamentals of digital logic to the actual design of an ARM processor. By the end of this book, readers will be able to build their own microprocessor and will have a top-to-bottom understanding of how it works.

Beginning with digital logic gates and progressing to the design of combinational and sequential circuits, this book uses these fundamental building blocks as the basis for designing an ARM processor.

SystemVerilog and VHDL are integrated throughout the text in examples illustrating the methods and techniques for CAD-based circuit design. The companion website includes a chapter on I/O systems with practical examples that show how to use the Raspberry Pi computer to communicate with

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peripheral devices such as LCDs, Bluetooth radios, and motors. This book will be a valuable resource for students taking a course that combines digital logic and computer architecture or students taking a two-quarter sequence in digital logic and computer organization/architecture. Covers the fundamentals of digital logic design and reinforces logic concepts through the design of an ARM microprocessor. Features side-by-side examples of the two most prominent Hardware Description Languages (HDLs)—SystemVerilog and VHDL—which illustrate and compare the ways each can be used in the design of digital systems. Includes examples throughout the text that enhance the reader's understanding and retention of key concepts and techniques. The Companion website includes a chapter on I/O systems with practical examples that show how to use the Raspberry Pi computer to communicate with peripheral devices such as LCDs, Bluetooth radios, and motors. The Companion website also includes appendices covering practical digital design issues and C programming as well as links to CAD tools, lecture slides, laboratory projects, and solutions to exercises.

Are you an RTL or system designer that is currently using, moving, or planning to move to an HLS design environment? Finally, a comprehensive guide for designing hardware using C++ is here. Michael Fingeroff's High-Level Synthesis Blue Book presents

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the most effective C++ synthesis coding style for achieving high quality RTL. Master a totally new design methodology for coding increasingly complex designs! This book provides a step-by-step approach to using C++ as a hardware design language, including an introduction to the basics of HLS using concepts familiar to RTL designers. Each chapter provides easy-to-understand C++ examples, along with hardware and timing diagrams where appropriate. The book progresses from simple concepts such as sequential logic design to more complicated topics such as memory architecture and hierarchical sub-system design. Later chapters bring together many of the earlier HLS design concepts through their application in simplified design examples. These examples illustrate the fundamental principles behind C++ hardware design, which will translate to much larger designs. Although this book focuses primarily on C and C++ to present the basics of C++ synthesis, all of the concepts are equally applicable to SystemC when describing the core algorithmic part of a design. On completion of this book, readers should be well on their way to becoming experts in high-level synthesis.

Advanced ASIC Chip Synthesis: Using Synopsys® Design Compiler® and PrimeTime® describes the advanced concepts and techniques used for ASIC chip synthesis, formal verification and static timing analysis, using the Synopsys suite of tools. In

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addition, the entire ASIC design flow methodology targeted for VDSM (Very-Deep-Sub-Micron) technologies is covered in detail. The emphasis of this book is on real-time application of Synopsys tools used to combat various problems seen at VDSM geometries. Readers will be exposed to an effective design methodology for handling complex, sub-micron ASIC designs. Significance is placed on HDL coding styles, synthesis and optimization, dynamic simulation, formal verification, DFT scan insertion, links to layout, and static timing analysis. At each step, problems related to each phase of the design flow are identified, with solutions and work-arounds described in detail. In addition, crucial issues related to layout, which includes clock tree synthesis and back-end integration (links to layout) are also discussed at length. Furthermore, the book contains in-depth discussions on the basics of Synopsys technology libraries and HDL coding styles, targeted towards optimal synthesis solutions. Advanced ASIC Chip Synthesis: Using Synopsys® Design Compiler® and PrimeTime® is intended for anyone who is involved in the ASIC design methodology, starting from RTL synthesis to final tape-out. Target audiences for this book are practicing ASIC design engineers and graduate students undertaking advanced courses in ASIC chip design and DFT techniques. From the Foreword:

`This book, written by Himanshu Bhatnagar,

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provides a comprehensive overview of the ASIC design flow targeted for VDSM technologies using the Synopsis suite of tools. It emphasizes the practical issues faced by the semiconductor design engineer in terms of synthesis and the integration of front-end and back-end tools. Traditional design methodologies are challenged and unique solutions are offered to help define the next generation of ASIC design flows. The author provides numerous practical examples derived from real-world situations that will prove valuable to practicing ASIC design engineers as well as to students of advanced VLSI courses in ASIC design'. Dr Dwight W. Decker, Chairman and CEO, Conexant Systems, Inc., (Formerly, Rockwell Semiconductor Systems), Newport Beach, CA, USA.

"This book covers aspects of system design and efficient modelling, and also introduces various fault models and fault mechanisms associated with digital circuits integrated into System on Chip (SoC), Multi-Processor System-on Chip (MPSoC) or Network on Chip (NoC)"--

This hands-on introduction to silicon photonics engineering equips students with everything they need to begin creating foundry-ready designs. Make workplace conflict resolution a game that EVERYBODY wins! Recent studies show that typical managers devote more than a quarter of their time to resolving coworker disputes. The Big Book of

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Conflict-Resolution Games offers a wealth of activities and exercises for groups of any size that let you manage your business (instead of managing personalities). Part of the acclaimed, bestselling Big Books series, this guide offers step-by-step directions and customizable tools that empower you to heal rifts arising from ineffective communication, cultural/personality clashes, and other specific problem areas—before they affect your organization's bottom line. Let The Big Book of Conflict-Resolution Games help you to: Build trust Foster morale Improve processes Overcome diversity issues And more Dozens of physical and verbal activities help create a safe environment for teams to explore several common forms of conflict—and their resolution. Inexpensive, easy-to-implement, and proved effective at Fortune 500 corporations and mom-and-pop businesses alike, the exercises in The Big Book of Conflict-Resolution Games delivers everything you need to make your workplace more efficient, effective, and engaged.

For Electrical Engineering and Computer Engineering courses that cover the design and technology of very large scale integrated (VLSI) circuits and systems. May also be used as a VLSI reference for professional VLSI design engineers, VLSI design managers, and VLSI CAD engineers. Modern VLSI Design provides a comprehensive “bottom-up” guide to the design of VLSI systems,

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from the physical design of circuits through system architecture with focus on the latest solution for system-on-chip (SOC) design. Because VSLI system designers face a variety of challenges that include high performance, interconnect delays, low power, low cost, and fast design turnaround time, successful designers must understand the entire design process. The Third Edition also provides a much more thorough discussion of hardware description languages, with introduction to both Verilog and VHDL. For that reason, this book presents the entire VSLI design process in a single volume.

This book provides a methodological understanding of the theoretical and technical limitations to the longevity of Moore's law. The book presents research on factors that have significant impact on the future of Moore's law and those factors believed to sustain the trend of the last five decades. Research findings show that boundaries of Moore's law primarily include physical restrictions of scaling electronic components to levels beyond that of ordinary manufacturing principles and approaching the bounds of physics. The research presented in this book provides essential background and knowledge to grasp the following principles: Traditional and modern photolithography, the primary limiting factor of Moore's law Innovations in semiconductor manufacturing that makes current generation CMOS processing possible Multi-disciplinary technologies that could drive Moore's law forward significantly Design principles for microelectronic circuits and components that take

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advantage of technology miniaturization The semiconductor industry economic market trends and technical driving factors The complexity and cost associated with technology scaling have compelled researchers in the disciplines of engineering and physics to optimize previous generation nodes to improve system-on-chip performance. This is especially relevant to participate in the increased attractiveness of the Internet of Things (IoT). This book additionally provides scholarly and practical examples of principles in microelectronic circuit design and layout to mitigate technology limits of previous generation nodes. Readers are encouraged to intellectually apply the knowledge derived from this book to further research and innovation in prolonging Moore's law and associated principles.

Authored by two of the leading authorities in the field, this guide offers readers the knowledge and skills needed to achieve proficiency with embedded software. Labs on Chip: Principles, Design and Technology provides a complete reference for the complex field of labs on chip in biotechnology. Merging three main areas— fluid dynamics, monolithic micro- and nanotechnology, and out-of-equilibrium biochemistry—this text integrates coverage of technology issues with strong theoretical explanations of design techniques. Analyzing each subject from basic principles to relevant applications, this book: Describes the biochemical elements required to work on labs on chip Discusses fabrication, microfluidic, and electronic and optical detection techniques Addresses planar technologies, polymer microfabrication, and process scalability to huge

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volumes Presents a global view of current lab-on-chip research and development Devotes an entire chapter to labs on chip for genetics Summarizing in one source the different technical competencies required, Labs on Chip: Principles, Design and Technology offers valuable guidance for the lab-on-chip design decision-making process, while exploring essential elements of labs on chip useful both to the professional who wants to approach a new field and to the specialist who wants to gain a broader perspective.

**KEY BENEFIT:** This hands-on book leads readers through the complete process of building a ready-to-fabricate CMOS integrated circuit using popular commercial design software. **KEY TOPICS:** The VLSI CAD flow described in this book uses tools from two vendors: Cadence Design Systems, Inc. and Synopsys Inc. Detailed tutorials include step-by-step instructions and screen shots of tool windows and dialog boxes.

**MARKET:** A useful reference for chip designers.

Digital Design of Signal Processing Systems discusses a spectrum of architectures and methods for effective implementation of algorithms in hardware (HW).

Encompassing all facets of the subject this book includes conversion of algorithms from floating-point to fixed-point format, parallel architectures for basic computational blocks, Verilog Hardware Description Language (HDL), SystemVerilog and coding guidelines for synthesis. The book also covers system level design of Multi Processor System on Chip (MPSoC); a consideration of different design methodologies including Network on Chip (NoC) and Kahn Process Network (KPN) based connectivity

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among processing elements. A special emphasis is placed on implementing streaming applications like a digital communication system in HW. Several novel architectures for implementing commonly used algorithms in signal processing are also revealed. With a comprehensive coverage of topics the book provides an appropriate mix of examples to illustrate the design methodology. Key Features: A practical guide to designing efficient digital systems, covering the complete spectrum of digital design from a digital signal processing perspective Provides a full account of HW building blocks and their architectures, while also elaborating effective use of embedded computational resources such as multipliers, adders and memories in FPGAs Covers a system level architecture using NoC and KPN for streaming applications, giving examples of structuring MATLAB code and its easy mapping in HW for these applications Explains state machine based and Micro-Program architectures with comprehensive case studies for mapping complex applications The techniques and examples discussed in this book are used in the award winning products from the Center for Advanced Research in Engineering (CARE). Software Defined Radio, 10 Gigabit VoIP monitoring system and Digital Surveillance equipment has respectively won APICTA (Asia Pacific Information and Communication Alliance) awards in 2010 for their unique and effective designs.

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