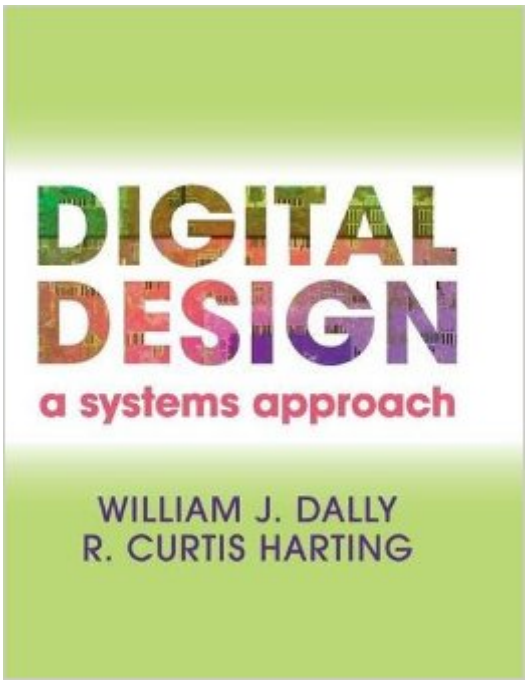
# Digital Design: A Systems Approach



## Synopsis

This introductory textbook provides students with a system-level perspective and the tools they need to understand, analyze and design digital systems. Going beyond the design of simple combinational and sequential modules, it shows how such modules are used to build complete systems, reflecting real-world digital design. All the essential topics are covered, including design and analysis of combinational and sequential modules, as well as system timing and synchronization. It also teaches how to write Verilog HDL in a productive and maintainable style that enables CAD tools to do much of the tedious work. A complete introduction to digital design is given through clear explanations, extensive examples and online Verilog files. The teaching package is completed with lecture slides, labs and a solutions manual for instructors. Assuming no previous digital knowledge, this textbook is ideal for undergraduate digital design courses that will prepare students for modern digital practice. "Dally and Harting blend circuit and architecture design in a clear and constructive manner on the basis of their exceptional experience in digital design. Students will discover a modern and effective way to understand the fundamental underpinning of digital design, by being exposed to the different abstraction levels and views of computing systems." - Giovanni De Micheli, EPFL Switzerland "Bill and Curt have combined decades of academic and industry experience to produce a textbook that teaches digital system design from a very practical perspective without sacrificing the theoretical understanding needed to train tomorrow’s engineers. Their approach pushes students to understand not just what they are designing but also what they are building. By presenting key advanced topics, such as synthesis, delay and logical effort, and synchronization, at the introductory level, this book is in the rare position of providing both practical advice and deep understanding. In doing so, this book will prepare students well even as technology, tools, and techniques change in the future." - David Black-Schaffer, Uppsala University "Everything you would expect from a book on digital design from Prof. Dally. Decades of practical experience are distilled to provide the tools necessary to design and compose complete digital systems. A clear and well written text that covers the basics and system-level issues equally well. An ideal starting point for the microprocessor and SoC designers of the future!" - Robert Mullins, University of Cambridge and the Raspberry Pi Foundation "This textbook sets a new standard for how digital system design is taught to undergraduates. The practical approach and concrete examples provides a solid foundation for anyone who wants to understand or design modern complex digital systems." - Steve Keckler, The University of Texas at Austin "This book not only teaches how to do digital design, but more importantly shows how to do good design. It stresses the importance of modularization with clean interfaces, and the importance of producing digital artifacts

that not only meet their specifications, but which can also be easily understood by others. It uses an aptly-chosen set of examples and the Verilog code used to implement them. It includes a section on the design of asynchronous logic, a topic that is likely to become increasingly important as energy consumption becomes a primary concern in digital systems. The final appendix on Verilog coding style is particularly useful. This book will be valuable not only to students, but to practitioners in the area. I recommend it highly." - Chuck Thacker, Microsoft

## Book Information

Hardcover: 636 pages

Publisher: Cambridge University Press; 1 edition (September 17, 2012)

Language: English

ISBN-10: 0521199506

ISBN-13: 978-0521199506

Product Dimensions: 7.4 x 1.2 x 9.7 inches

Shipping Weight: 3.4 pounds (View shipping rates and policies)

Average Customer Review: 3.1 out of 5 stars 12 customer reviews

Best Sellers Rank: #108,955 in Books (See Top 100 in Books) #28 inÂ Books > Engineering & Transportation > Engineering > Electrical & Electronics > Circuits > Design #53 inÂ Books > Engineering & Transportation > Engineering > Electrical & Electronics > Digital Design #685 inÂ Books > Computers & Technology > Computer Science

## Customer Reviews

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This book provides students with a system-level perspective and the tools they need to understand, analyze and design complete digital systems using Verilog. It goes beyond the design of simple combinational and sequential modules to show how such modules are used to build complete systems, reflecting digital design in the real world.

Several important things that this textbook falls short of to qualify as well made.The chapter sections are bulky.There is no glossary of terms.There are no/little answers and explanations for the exercises.I expect more from a textbook to help a student learn efficiently.

It took two weeks for the book to arrive, and the book was already bent when it arrived. Further more, the book continues to break apart even though I only used a few times for assignments.

The authors give an excellent education about digital computers from the ground up. It starts with Boolean logic, showing how you can abstractly build quite sophisticated digital circuitry from just an AND, OR and inverter circuits. Along the way, the book teaches the use of Verilog, which is the standard hardware description language used by professional designers. The incorporation of Verilog is an improvement over books from earlier years which might (actually, often) omitted any mention. The advantage is that there exist many simulators into which the student [you] can shove a set of equations, and get output of a circuit and its expected behaviour. Going further still, if you write in Verilog, a compiled version can be made, where here an executable means that it can be coded into a Field Programmalble Logic Array. You can write and compile and install as hardware. Quite an advance over pure programming.The text goes on to CMOS logic circuitry. CMOS is the most common way that digital circuits are built these days. BiCMOS and bipolar have largely been supplanted, and you can safely ignore most descriptions of those in other books.As the text progresses, more intricate building blocks are invoked, like multiplexers [muxes] and comparators. But where you should perhaps pay attention is in how arithmetic is done. It all starts with simple adders. You learn about one’s complement and two’s complement arithmetic. And how subtraction can be fitted into addition, using two’s complement. Then about the carry out and carry in bits, when you make longer adders from short adders. It is the delay in carry bits propagating through a daisy chain of such adders that is the fundamental cause of delay in doing adding.Taking this further, multiplication is a crafty way [well, several such ways] of stuffing together adders. While division can be done by multipliers, using essentially the same way that subtraction is done as addition.Hopefully, you can appreciate the elegance of how starting with the encoding of 0 and 1 in a single bit circuit (like a flip flop), we progress all the way to multiplication and division of, say, 32 bit numbers. From the seemingly trivial to what is essentially what is done by every calculator.Finite state machines are delved into where you reach time dependent behaviour. A vital way to understand and code the complexity in the latter.

This is a very well written book. The wording is spot on without losing its accuracy or dumbing down the subject. It covers all the bases needed for some pretty decent digital design. Informative and thought-provoking problems at the end that really tested the knowledge of the subjects.The book itself is insanely heavy and thick. You can tell just by holding onto it that it is chock full of tons of valuable information!It is an excellent reference/tutorial book for anyone just learning about Digital Design, as well as an excellent refresher for those like me who have not done any digital designing

for several years. The book brought me back up to speed with just two weeks of earnest effort. It also plowed new ground on more up-to-date advances in the field, as well.A necessity if you are deciding to take an introductory Digital Design/Logic course.

It’s not terrible, but the way the book can define new concepts can be confusing. It takes me a long time and some googling to figure out what the author is trying to explain sometimes. The way he describes what hazards are in chapter 6 ends up complicating a really simple topic, which seems to be a reoccurring theme with this book. Just wait till you get to the explanation on multiplexers in Chapter 8-- instead of taking the time out to write out a simple explanation, that albeit is slightly redundant, he kind of puts the alternative values in parentheses and doesn’t give an example or explanation in WTH he’s doing. Again some of the stuff is well explained, which is especially nice if your professor isn’t ideal. Other than that, good luck.

This is the most readable of academic textbooks on Digital Logic (although it lacks the enthusiasm of "Bebop to the Boolean Boogie" by Clive Maxfield). Extensive use is made of Verilog as a logic description language, and state machines, an important concept in the design of time and state dependent logic are explained fully. Given the coverage of Verilog, I might have appreciated some introduction to FPGA’s to round out the modern focus and coverage of this volume.

good book

Binding on the book was really bad and came loose after a couple uses. Content-wise a great introduction, but does not go much beyond that.

Digital Pictures (Photography, DSLR, cameras, digital photography, digital pictures, portrait photography, landscape photography) Introduction to Embedded Systems: Using ANSI C and the Arduino Development Environment (Synthesis Lectures on Digital Circuits and Systems) Career Building Through Using Digital Design Tools (Digital Career Building) Digital Drawing for Landscape Architecture: Contemporary Techniques and Tools for Digital Representation in Site Design The Adobe Photoshop Lightroom: 17 Tips You Should Know to Get Started Using Photoshop Lightroom (For Digital Photographers) (Graphic Design, Adobe Photoshop, Digital Photography, Lightroom) Fundamentals Of Information Systems Security (Information Systems Security & Assurance) - Standalone book (Jones & Bartlett Learning Information Systems Security & Assurance) Design, When Everybody Designs: An Introduction to Design for Social Innovation (Design Thinking, Design Theory) Digital Systems Design and Prototyping: Using Field Programmable Logic and Hardware Description Languages VLSI Digital Signal Processing Systems: Design and Implementation Digital Systems Design Using VHDL State Estimation in Electric Power Systems: A Generalized Approach (Power Electronics and Power Systems) Medical Terminology Systems: A Body Systems Approach Medical Terminology Systems (Text Only): A Body Systems Approach