

# Fundamentals Of Digital Logic With Vhdl Design 3rd Edition

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fundamentals of digital logic with vhdl design teaches the basic design techniques for logic circuits the text provides a clear and easily understandable discussion of logic circuit design without the use of unnecessary formalism it emphasizes the synthesis of circuits and explains how circuits are implemented in real chips fundamental concepts are illustrated by using small examples which are easy to understand then a modular approach is used to show how larger circuits are designed vhdl is a complex language so it is introduced gradually in the book each vhdl feature is presented as it becomes pertinent for the circuits being discussed while it includes a discussion of vhdl the book provides thorough coverage of the fundamental concepts of logic circuit design independent of the use of vhdl and cad tools a cd rom containing all of the vhdl design examples used in the book as well altera s quartus ii cad software is included free with every text

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a completely updated and expanded comprehensive treatment of vhdl and its applications to the design and simulation of real industry standard circuits this comprehensive treatment of vhdl and its applications to the design and simulation of real industry standard circuits has been completely updated and expanded for the third edition new features include all vhdl 2008 constructs an extensive review of digital circuits rtl analysis and an unequalled collection of vhdl examples and exercises the book focuses on the use of vhdl rather than solely on the language with an emphasis on design examples and laboratory exercises the third edition begins with a detailed review of digital circuits combinatorial sequential state machines and fpgas thus providing a self contained single reference for the teaching of digital circuit design with vhdl in its coverage of vhdl 2008 it makes a clear distinction between vhdl for synthesis and vhdl for simulation the text offers complete vhdl codes in examples as well as simulation results and comments the significantly expanded examples and exercises include many not previously published with multiple physical demonstrations meant to inspire and motivate students the book is suitable for undergraduate and graduate students in vhdl and digital circuit design and can be used as a professional reference for vhdl practitioners it can also serve as a text for digital vlsi in house or academic courses

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digital electronics and design with vhdl offers a friendly presentation of the fundamental principles and practices of modern digital design unlike any other book in this field transistor level implementations are also included which allow the readers to gain a solid understanding of a circuit s real potential and limitations and to develop a realistic perspective on the practical design of actual integrated circuits coverage includes the largest selection available of digital circuits in all categories combinational sequential logical or arithmetic and detailed digital design techniques with a thorough discussion on state machine modeling for the analysis and design of complex sequential systems key technologies used in modern circuits are also described including bipolar mos rom ram and cpld fpga chips as well as codes and techniques used in data storage and transmission designs are illustrated by means of complete realistic applications using vhdl where the complete code comments and simulation results are included this text is ideal for courses in digital design digital logic digital electronics vlsi and vhdl and industry practitioners in digital electronics comprehensive coverage of fundamental digital concepts and principles as well as complete realistic industry standard designs many circuits shown with internal details at the transistor level as in real integrated circuits actual technologies used in state of the art digital circuits presented in conjunction with fundamental concepts and principles six chapters dedicated to vhdl based techniques with all vhdl based designs synthesized onto cpld fpga chips

the methodology described in this book is the result of many years of research experience in the field of synthesizable vhdl design targeting fpga based platforms vhdl was first conceived as a documentation language for asic designs afterwards the language was used for the behavioral simulation of asics and also as a design input for synthesis tools vhdl is a rich language but just a small subset of it can be used to write synthesizable code from which a physical circuit can be obtained usually vhdl books describe both synthesis and simulation aspects of the language but in this book the reader is conducted just through the features acceptable by synthesis tools the book introduces the subjects in a gradual and concise way providing just enough information for the reader to develop their synthesizable digital systems in vhdl the examples in the book were planned targeting an fpga platform widely used around the world

a presentation of circuit synthesis and circuit simulation using vhdl including vhdl 2008 with an emphasis on design examples and laboratory exercises this text offers a comprehensive treatment of vhdl and its applications to the design and simulation of real industry standard circuits it focuses on the use of vhdl rather than solely on the language showing why and how certain types of circuits are inferred from the language constructs and how any of the four simulation categories can be implemented it makes a rigorous distinction between vhdl for synthesis and vhdl for simulation the vhdl codes in all design examples are complete and circuit diagrams physical synthesis in fpgas simulation results and explanatory comments are included with the designs the text reviews fundamental concepts of digital electronics and design and includes a series of appendixes that offer tutorials on important design tools including ise quartus ii and modelsim as well as descriptions of programmable logic devices in which the designs are implemented the de2 development board standard vhdl packages and other features all four vhdl editions 1987 1993 2002 and 2008 are covered this expanded second edition is the first textbook on vhdl to include a detailed analysis of circuit simulation with vhdl testbenches in all four categories nonautomated fully automated functional and timing simulations accompanied by complete practical examples chapters 1 9 have been updated with new design examples and new details on such topics as data types and code statements chapter 10 is entirely new and deals exclusively with simulation chapters 11 17 are also entirely new presenting extended and advanced designs with theoretical and practical coverage of serial data communications circuits video circuits and other topics there are many more illustrations and the exercises have been updated and their number more than doubled

hardware logic design

a result of k c chang s practical experience in both design and as an instructor this book presents an integrated approach to digital design principles processes and implementations to help the reader design much more complex systems within a shorter design cycle many of the design techniques and considerations illustrated throughout the chapters are examples of viable designs

since the publication of the first edition a new version of the vhdl standard has been agreed and analogue extensions to the language have also been adopted the second edition of digital system design with vhdl includes additions in two important areas sections on writing testbenches have been added to relevant chapters and the addition of a new chapter on vhdl ams and mixed signal modeling the unique approach will be appreciated by undergraduates in electronic engineering and computer engineering in all years of their courses and by students undertaking postgraduate study there is also a proven need from industry for graduates with knowledge of vhdl and the associated design tools and this

book will be an asset to engineers who wish to continue their studies

a guide to applying software design principles and coding practices to vhdl to improve the readability maintainability and quality of vhdl code this book addresses an often neglected aspect of the creation of vhdl designs a vhdl description is also source code and vhdl designers can use the best practices of software development to write high quality code and to organize it in a design this book presents this unique set of skills teaching vhdl designers of all experience levels how to apply the best design principles and coding practices from the software world to the world of hardware the concepts introduced here will help readers write code that is easier to understand and more likely to be correct with improved readability maintainability and overall quality after a brief review of vhdl the book presents fundamental design principles for writing code discussing such topics as design quality architecture modularity abstraction and hierarchy building on these concepts the book then introduces and provides recommendations for each basic element of vhdl code including statements design units types data objects and subprograms the book covers naming data objects and functions commenting the source code and visually presenting the code on the screen all recommendations are supported by detailed rationales finally the book explores two uses of vhdl synthesis and testbenches it examines the key characteristics of code intended for synthesis distinguishing it from code meant for simulation and then demonstrates the design and implementation of testbenches with a series of examples that verify different kinds of models including combinational sequential and fsm code examples from the book are also available on a companion website enabling the reader to experiment with the complete source code

this book presents the theory that is necessary for understanding the fundamentals of digital logic design in an easily understandable approach without the use of unnecessary formalism it emphasizes the design of digital networks and systems with clear explanations exceptional collection of design examples solved problems and many exercises the text provides such fundamental concepts as number systems boolean algebra logic gates minimization of logic functions combinational network design with logic gates combinational logic design with standard modules arithmetic network design and introduction to design reliability of digital systems the text presents after covering the basics modern design techniques using programmable logic devices and the vhdl hardware description language the book also introduces altera s quartus ii cad software this textbook is intended for an introductory course in logic design taken by engineering engineering technology and computer science students for self learning or as a good reference for engineers and professionals about the author michael h hassan holds b s in electrical engineering m s in electronics engineering and m s and ph d in electrical and computer engineering from wsu michigan usa he is a senior member of ieee member of sigma xi the scientific research society tau beta pi the engineering honor society and eta kappa nu the electrical engineering honor society dr hassan received the ieee 2009 outstanding engineering educator award his teaching and research interests include digital systems theory and design microcomputer systems microelectronics and vlsi design reconfigurable computing image processing and vision systems communication systems and networks and alternative energy systems he is the author of many papers and four textbooks including microprocessors and systems design isbn 9780981619439 microprocessors hardware and software design using mc68000 isbn 9780981619408 digital electronics with vhdl design isbn 9780981619415 and fundamentals of digital design with vhdl isbn 9780981619446

digital systems design with vhdl and synthesis presents an integrated approach to digital design principles processes and implementations to

help the reader design much more complex systems within a shorter design cycle this is accomplished by introducing digital design concepts vhdl coding vhdl simulation synthesis commands and strategies together the author focuses on the ultimate product of the design cycle the implementation of a digital design vhdl coding synthesis methodologies and verification techniques are presented as tools to support the final design implementation readers will understand how to apply and adapt techniques for vhdl coding verification and synthesis to various situations digital systems design with vhdl and synthesis is a result of k c chang s practical experience in both design and as an instructor many of the design techniques and considerations illustrated throughout the chapters are examples of viable designs his teaching experience leads to a step by step presentation that addresses common mistakes and hard to understand concepts in a way that eases learning unique features of the book include the following vhdl code explained line by line to capture the logic behind the design concepts vhdl is verified using vhdl test benches and simulation tools simulation waveforms are shown and explained to verify design correctness vhdl code is synthesized and commands and strategies are discussed synthesized schematics and results are analyzed for area and timing variations on the design techniques and common mistakes are addressed demonstrated standard cell gate array and fpga three design processes each with a complete design case study test bench post layout verification and test vector generation processes practical design concepts and examples are presented with vhdl code simulation waveforms and synthesized schematics so that readers can better understand their correspondence and relationships

electronic systems based on digital principles are becoming ubiquitous a good design approach to these systems is essential and a top down methodology is favoured such an approach is vastly simplified by the use of computer modeling to describe the systems vhdl is a formal language which allows a designer to model the behaviours and structure of a digital circuit on a computer before implementation digital system design with vhdl is intended both for students on digital design courses and practitioners who would like to integrate digital design and vhdl synthesis in the workplace its unique approach combines the principles of digital design with a guide to the use of vhdl synthesis issues are discussed and practical guidelines are provided for improving simulation accuracy and performance features a practical perspective is obtained by the inclusion of real life examples an emphasis on software engineering practices encourages clear coding and adequate documentation of the process demonstrates the effects of particular coding styles on synthesis and simulation efficiency covers the major vhdl standards includes an appendix with examples in verilog

fundamentals of digital logic with vhdl design 4th edition is intended for an introductory course in digital logic design which is a basic course in most electrical and computer engineering programs a successful designer of digital logic circuits needs a good understanding of basic concepts and a firm grasp of computer aided design cad tools

this text is intended for an introductory digital design course for students at the freshman level it also is intended for an introductory computer design course with assembly language programming for students at the sophomore level this text uses a sp

this textbook teaches vhdl using system examples combined with programmable logic and supported by laboratory exercises while other textbooks concentrate only on language features circuit design with vhdl offers a fully integrated presentation of vhdl and design concepts by

including a large number of complete design examples illustrative circuit diagrams a review of fundamental design concepts fully explained solutions and simulation results the text presents the information concisely yet completely discussing in detail all indispensable features of the vhdl synthesis the book is organized in a clear progression with the first part covering the circuit level treating foundations of vhdl and fundamental coding and the second part covering the system level units that might be located in a library for code sharing reuse and partitioning expanding upon the earlier chapters to discuss system coding part i circuit design examines in detail the background and coding techniques of vhdl including code structure data types operators and attributes concurrent and sequential statements and code objects signals variables and constants design of finite state machines and examples of additional circuit designs part ii system design builds on the material already presented adding elements intended mainly for library allocation it examines packages and components functions and procedures and additional examples of system design appendixes on programmable logic devices plds fpgas and synthesis tools follow part ii the book s highly original approach of teaching through extensive system examples as well as its unique integration of vhdl and design make it suitable both for use by students in computer science and electrical engineering

the purpose of this book is to introduce vhsic hardware description language vhdl and its use for synthesis vhdl is a hardware description language which provides a means of specifying a digital system over different levels of abstraction it supports behavior specification during the early stages of a design process and structural specification during the later implementation stages vhdl was originally introduced as a hardware description language that permitted the simulation of digital designs it is now increasingly used for design specifications that are given as the input to synthesis tools which translate the specifications into netlists from which the physical systems can be built one problem with this use of vhdl is that not all of its constructs are useful in synthesis the specification of delay in signal assignments does not have a clear meaning in synthesis where delays have already been determined by the implementation technology vhdl has data structures such as files and pointers useful for simulation purposes but not for actual synthesis as a result synthesis tools accept only subsets of vhdl this book tries to cover the synthesis aspect of vhdl while keeping the simulation specifics to a minimum this book is suitable for working professionals as well as for graduate or under graduate study readers can view this book as a way to get acquainted with vhdl and how it can be used in modeling of digital designs

this book will teach students how to design digital logic circuits specifically combinational and sequential circuits students will learn how to put these two types of circuits together to form dedicated and general purpose microprocessors this book is unique in that it combines the use of logic principles and the building of individual components to create data paths and control units and finally the building of real dedicated custom microprocessors and general purpose microprocessors after understanding the material in the book students will be able to design simple microprocessors and implement them in real hardware

written for an advanced level course in digital systems design digital systems design using vhdl integrates the use of the industry standard hardware description language vhdl into the digital design process following a review of basic concepts of logic design in chapter 1 the author introduces the basics of vhdl in chapter 2 and then incorporates more coverage of vhdl topics as needed with advanced topics covered in chapter 8 rather than simply teach vhdl as a programming language this book emphasizes the practical use of vhdl in the digital design

process for example in chapter 9 the author develops vhdl models for a ram memory and a microprocessor bus interface he then uses a vhdl simulation to verify that timing specifications for the interface between the memory and microprocessor bus are satisfied the book also covers the use of cad tools to synthesize digital logic from a vhdl description in chapter 8 and stresses the use of programmable logic devices including programmable gate arrays chapter 10 introduces methods for testing digital systems including boundary scan and a built in self test

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