

Preface

This text offers a comprehensive coverage of VHDL and its applications to the design of digital circuits. It is a completely updated and expanded version of its highly successful first and second editions, now including all VHDL-2008 constructs and several new features, such as an extensive review of digital circuits, RTL analysis, and a superior collection of VHDL design examples and exercises. It is suitable for undergraduate and graduate courses on VHDL and digital circuits design in the areas of electrical/computer engineering and computer science, in-house courses on VHDL and digital circuits design, and engineers and other VHDL practitioners in the industry. The only background knowledge needed to follow the book is familiarity with basic digital logic concepts and circuits. Because of the tight combination of digital circuits analysis, detailed VHDL code, and industry-standard examples and exercises, this text is also recommended for digital VLSI courses and digital VLSI designers in general.

Before entering VHDL (chapters 5–18), a review of digital circuits is presented (chapters 1–4), resulting in a self-contained text that allows the teaching of digital circuits design with VHDL using a single reference. To complete this self-containment, all tutorials needed for synthesis and simulation (with Xilinx and Intel FPGAs) are included in the appendixes. The review chapters cover all classes of digital circuits, which consist of combinational logic circuits, combinational arithmetic circuits, sequential circuits, and sequential circuits modeled as finite state machines. A review of FPGAs is also included. Full VHDL-2008 coverage is presented, while still keeping the text as concise as possible. The same acclaimed sequence of topics in the previous two editions was maintained, with updated descriptions and modern examples carefully planned to make the understanding of the language simple and enjoyable.

Additionally, a clear separation (unusual elsewhere) between code that is for synthesis versus code that is for simulation is made. In summary, everything in chapters 5–17 is synthesizable, while the topics that are specific for simulation are concentrated in chapter 18. The VHDL codes in the examples are always complete (also unusual elsewhere), and not just partial sketches. Moreover, simulation results and comments are also offered.

The collections of examples and exercises were hugely expanded and include many not seen before in the literature. That was possible because of the review chapters, which present

the necessary background and, at the same time, keep it separated from the VHDL chapters, so that a neater and more profound coverage results. Further, an enormous effort was devoted to making the examples and exercises interesting to students, with very illustrative physical demonstrations, which are crucial for their motivation. Finally, RTL analysis and discussions on hardware optimization are also included in many of the examples and exercises in this edition of the book. For that, too, the review chapters were fundamental.