

ECE 545—Digital System Design with VHDL
Department of Electrical and Computer Engineering
George Mason University
Fall 2008

Lectures: Tuesday, 4:30 – 7:10 pm, Krug Hall, Room 19
Hands-on sessions will be held periodically during class hours in Science & Tech II, Room 203.

Web Page: <http://mason.gmu.edu/~dhwang/ece545/fall2008/>

Instructor: Dr. David Hwang
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Office Hours: Monday, 3:30 – 5:30 pm, Science & Tech II, Room 229

TA: Shaunak Shah
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Office Hours: Monday, 1:30 – 3:30 PM, Science and Tech II, Room 203
Thursday, 4:30 – 6:30 PM, Science and Tech I, Room 2B (2D)

Course Description

Introduces the design of complex digital systems using hardware description languages. Teaches design methodologies which partition a system into a datapath and controller. Focuses on synthesizable RTL VHDL code for digital circuit design using dataflow, structural, and behavioral coding styles. Introduces VHDL simulation and verification, and FPGA synthesis, placement, routing, timing analysis and performance optimization. Requires semester-long project devoted to the design of a complex digital system implemented on FPGAs.

Prerequisites: Graduate Standing. No official course prerequisite is required, but an undergraduate background in digital logic design is strongly recommended.

Required Textbooks

Volnei A. Pedroni, *Circuit Design with VHDL*, The MIT Press, 2004, ISBN: 0-262-16224-5.
Sundar Rajan, *Essential VHDL: RTL Synthesis Done Right*, S & G Publishing, 1998.

Supplementary Textbooks

Stephen Brown and Zvonko Vranesic, *Fundamentals of Digital Logic with VHDL Design, 3rd Edition*, McGraw-Hill, 2008, ISBN: 0073529532. [Note: The 2nd edition of this book is also acceptable]

Peter J. Ashenden, *The Designer's Guide to VHDL, 3rd Edition*, Morgan Kaufman, 2008, ISBN: 0120887851. [Note: The 2nd edition of this book is also acceptable]

Communication

Communication will be made from the instructor via email and the course web page. I will send emails to your official GMU email account; be sure to check this regularly or forward your GMU mail to an account you check regularly. Lectures will be posted on the web page for download by 12 noon on the day of class. Please check the web page regularly for course updates and announcements.

Grading

Your course grade will be determined by a combination of homework, project, midterm, and final exam:

Homework	15%
Project	30%
Midterm Exam	25%
Final Exam	30%

Schedule

Lectures are on Tuesday from 4:30 – 7:10 pm. Occasionally, we will meet in Science & Tech II, room 203 for hands-on sessions with the CAD tools during these hours. Please make note of the following specific dates of the schedule:

Tuesday, Oct 14	No class due to Columbus Day
Tuesday, Oct 28	Midterm Exam
Tuesday, Dec 9	Final Exam

Topics

Language: VHDL syntax, VHDL for synthesis (modeling of combinational and sequential logic), VHDL testbenches, finite state machines, algorithmic state machines, memories (RAM, ROM), VHDL behavioral modeling.

CAD Tools/FPGAs: VHDL Simulation (Active-HDL, Modelsim), FPGA Synthesis (XST, Synplify Pro), FPGA Implementation and Static Timing Analysis (ISE).

Application Domains: Cryptography, Signal Processing, Microprocessors.

Attendance

There is no explicit attendance requirement, but students are expected to attend all courses. If you are absent, you are responsible for turning homework on time and obtaining class notes from another student.

Homework

Students are required to submit all homework assignments. No late homework will be accepted. Homework assignments are to be completed individually.

Projects

Projects are to be completed individually or in groups of two. Further details will be given as the semester progresses. No late projects will be accepted.

Students with Disabilities

Please talk with me to make arrangements to accommodate your needs.

Honor Code

All rules of the GMU Honor Code system will be in effect. All students should be familiar with the code and abide by its rules. Cheating is taken very seriously. If you violate the honor code, you will be reported to the honor committee and may face sanctions ranging from an F in the course to expulsion from GMU. The honor code (<http://www.gmu.edu/catalog/apolicies/#Anchor13>) states:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.