ECE 448: FPGA Design with VHDL
Spring 2024

Instructor

Dr. Weiwen Jiang
The Nguyen Engineering Building, room 3247
In Person Office hours: Monday, Wednesday, 2:00-3:00 PM

Lecture

Monday, Wednesday, 12:00-13:15 PM, Exploratory Hall L003

Web page

https://jqub.ece.gmu.edu/2024/01/01/24SECE448/

Grading

Lab assignments:	40%
Lab exercises:	4%
Quizzes & homework:	6%
Midterm exam for the lecture:	10%
Midterm exam for the lab:	15%
Final exam:	25%
Open-ended project or Labs:	5% bonus

Schedule

1. Objectives, Scope, and Organization. 01/17/2024
2. HDL Refresher Quiz. 01/22/2024
3. Introduction to Testbenches. 01/24/2024
4. Combinational-Circuit Building Blocks (1) 01/29/2024,
5. Combinational-Circuit Building Blocks (2) 01/31/2024
6. Sequential-Circuit Building Blocks (1). 02/05/2024
7. Sequential-Circuit Building Blocks (2). 02/07/2024
8. Introduction to Basys 3. Using Seven-Segment Displays, LEDs, Switches, and Buttons. 02/12/2024
9. Introduction to Lab 4. The LightsOut Puzzle. 02/19/2024
10. Finite State Machines: State Diagrams, ASM Charts, and VHDL Code. 02/21/2024
11. Review for the Midterm Exam. 02/26/2024
12. **Midterm Exam. 02/28/2024**
13. Implementing Circuits with Regular Structure. 03/11/2024
14. Programmable Logic Memories. 03/13/2024
15. Introduction to the FPro System. 03/18/2024
16. Bare Metal System Software Development. 03/20/2024

17. Drivers of the LED-MUX Core & Debouncing Core. 03/25/2024
18. Software/Hardware Co-design Using the FPro System. Part 1: Sorting Core. 03/27/2024
19. Software/Hardware Co-design Using the FPro System. Part 2: Sorting Core. 04/01/2024
20. I/O Register Map of an MMIO Core. Part 1: Exact Address Decoding. 04/03/2024
21. I/O Register Map of an MMIO Core. Part 2: Simplified Address Decoding. 04/08/2024
22. Software/Hardware Co-design Using the FPro System. Part 3: I/O Register Map and a Wrapper of the Sorting Core. 04/10/2024
23. The FPro Video Subsystem: VGA Display & Frame Buffer Core. 04/15/2024
24. Video cores. 04/17/2024
25. Timing Analysis. 04/22/2024
26. RTL Design Methodology. 04/24/2024
27. Review before the Final Exam. 04/29/2024
    Final Exam. 05/06/2024, 10:30 AM-1:15 PM

Literature

Required Textbooks

Pong P. Chu, *FPGA Prototyping by VHDL Examples: Xilinx MicroBlaze MCS SoC*, Wiley, 2017, 2nd edition.

Supplementary Textbooks

Stephen Brown and Zvonko Vranesic, *Fundamentals of Digital Logic with VHDL Design*, McGraw-Hill, 2008, 3rd edition.

Ricardo Jasinski, *Effective Coding with VHDL: Principles and Best Practice*, The MIT Press, 2016 © 1st edition.

Honor Code

All rules of the Mason Honor Code will be strictly enforced. You should review the rules and interpretations of the Mason Code available at
https://oai.gmu.edu/full-honor-code-document/ ,
and be familiar with them.

Students with Disabilities

If you need special assistance, please inform the instructor and the Office of Disability Services (ODS, http://ods.gmu.edu) as soon as possible. All special accommodations must be arranged through ODS.

Basic Course Technology Requirements

Activities and assignments in this course will regularly use the Blackboard learning system, available at https://mymason.gmu.edu. Students are required to have regular, reliable access to a computer and a stable broadband Internet connection (cable modem, DSL, satellite broadband, etc., with a consistent 1.5 Mbps [megabits per second] download speed or higher.

Activities in this course will regularly use web-conferencing software:
- Zoom for office hours and project meetings.

In addition to the requirements above, students are required to have a device with a functional camera and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm.

Academic Integrity

The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

For more information about the Mason Honor Code and about the Honor Committee, please visit the website for the Office of Academic Integrity (http://oai.gmu.edu).

Safe Return to Campus

All students are strongly encouraged to get vaccinated, including a booster. You can get a vaccine on the Fairfax Campus.

Mason campuses are mask-optional except in health care settings and when instructed by a healthcare professional due to illness or close contact with someone with COVID. However, if you are more comfortable wearing a mask, feel free to continue. We still encourage you to wear a mask indoors.

If you test positive for COVID or are diagnosed with COVID, please report your positive case through Mason COVID Health Check. Mason uses this information to identify possible outbreaks and monitor COVID case counts within the Mason community for decision-making purposes.

Mason provides free COVID testing on campus.

For more information, please visit:
https://www.gmu.edu/safe-return-campus/mason-covid-updates/updates-students