

**CMPE 415: PROGRAMMABLE LOGIC DEVICES**  
**UMBC**  
**FALL 2018**

1. COURSE DESCRIPTION

This course covers the concepts, structure and programming characteristics of programmable logic devices such as PLDs and FPGAs. Hardware Description Languages (HDLs) are used to create designs that are tested on FPGA devices.

2. COURSE DETAILS

2.1. **Instructor.**

- Professor Ryan Robucci
- Department of Computer Science and Electrical Engineering
- ITE 319 Telephone x5-3549
- Email: robucci@umbc.edu
- Office Hours: TBD and by appointment

2.2. **Course Textbook.**

- The Design Warrior's Guide to FPGAs, Devices, Tools and Flows, Clive "Max" Maxfield, ISBN: 0-7506-7604-3
- Modeling, Synthesis and Rapid Prototyping with the Verilog HDL, Michael D. Ciletti, ISBN: 0-13-977398-3
- Advanced Digital Logic Design Using Verilog, State Machines and Synthesis for FPGAs, Sunggu Lee, ISBN: 0-534-55161-0
- The Verilog® Hardware Description Language, Donald E. Thomas, Philip R. Moorby
- and other recommended texts will be listed on website

2.3. **Logistics.**

- Course website can be found at <http://eclipse.umbc.edu/robucci/cmpe415>
- Meeting times: TThu 2:30PM - 3:45PM Fine Arts 015

**Prerequisites.**

- Required: CMPE 310 - Systems Design and Programming

3. MAJOR LEARNING OBJECTIVES

- Students learn the design flow and simulation processes associated with creating and verifying a design using Verilog and synthesizing it on FPGAs.
  - Student learn Verilog syntax
  - Students can write synthesizable code and can identify unsynthesizable code.
  - Student know how to write and use a simulation testbench written in Verilog

- Students learn to use tools to synthesize code, inspect results using RTL and implementation views, run place-and-route tools, and verify timing constraints were met.
- Students learn about the architecture and different technologies of programmable logic devices (FPGAs).
- Students develop and understanding of the available prefabricated IP blocks on modern FPGAs and learn how to use them in their designs.
- Students learn how to write hardware descriptions for combinational blocks and sequential units including state machines in Verilog.
- Students learn to design FPGA to computer hardware interface
- Student learn how to interface and external RAM.
- Students learn to work with modern FPGA design tools including Xilinx ISE and Core Generator.
- Students integrate a system composed of a number of pre-designed blocks including memory, a small microprocessor or a state machine and required interfaces on a FPGA board and implement a data transfer/processing system.

#### 4. COURSEWORK, GRADING, AND ASSESSMENT

Grading of students includes the following:

- Homeworks 45 %
- Midterm Exam 20%
- Final Exam 25%
- Quizzes 10%

4.1. **Exams and Quizzes:** There will be one mid-term exams and quizzes will we be given as nessisary to monitor learning. 90% or above will be garunteed an A, 80%+ is at least a B, 70%+ is at least a C, and 60%+ is at least a D.

4.1.1. *Make-up Exams:* If an exam is missed without a really good excuse, the grade is a zero. If the exam is missed with a really good excuse and the instructor is notified in advance, there may be a make-up exam administered or the average score of the other exams may be used, at the instructor's option.

4.2. **Homeworks.** Students will perform regular homeworks. Though homeworks enable me to assess the progress of students, the homeworks are primarily intended to provide hands-on learning and self-assessment. Homeworks are valuable as a learning experience and I emphasize that more than the aspect of professor-student assessment. For instance, assistance and even answers are sometimes provided for some homework problems. Homeworks may involve book-type problems, but in this course they will be heavily based on design, coding, simulation, and experimentation with an FPGA. This encourages traditional theoretical study and learning, as well as learning through design and true problem solving. Homeworks are intended to teach and encourage extra study. It is expected that students may require the professors guidance to complete some assignments. It is your responsibility to contact me in a timely matter to complete the assignments on-time. This encouraged opportunity for interaction with the professor provides for a better learning experience and allows the teacher to evaluate comprehension and make adjustments to the course. Homeworks are to be completed individually unless otherwise stated.

Cheating, which includes for example sharing or accepting of other student's code, will at minimum result in a zero on an assignment in addition to a letter grade reduction in the course, as well as appropriate reporting to the UMBC Academic Integrity Database.

**4.3. Incomplete Grades.** A grade of incomplete will be given only under exceptional circumstances described by the University policy for granting incompletes. Any such circumstance **MUST** be brought to the instructor's attention immediately as soon as it is known. Failure to complete assignments on time is not a sufficient reason for an incomplete. If you feel you are falling behind, seek help immediately.

**4.4. Final Grading.** If you feel you are falling behind, seek help immediately. To be fair to the most students, your grade will be based on performance during the semester in this class. Please do not expect plan to email me after the semester asking me to reconsider the judgment for your grade except in extreme and unusual circumstances or if you think there is an "accounting" error. I can assure you I give an extreme amount of consideration and care during final grade assignment. Given my grading methodology, I don't believe it is a fair practice for me to selectively reevaluate, reconsider, and change grades upon request.

**4.5. Academic Misconduct.** All students are expected to be knowledgeable on all University policies on academic misconduct. All work a student presents, both homework and exams, must be his or her own exclusively unless otherwise directed. Any cheating or plagiarism will not be tolerated, and will subject the student to a grade of F or worse, without any warnings. Any false or misleading representations to the instructor will also be considered as academic misconduct. By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty and they are wrong. Academic misconduct could result in disciplinary action that may include suspension or dismissal. To read the full policy on academic integrity, consult the UMBC Student Handbook, Faculty Handbook or the UMBC Policies section of the UMBC Directory.