Fort Lewis College

COURSE SYLLABUS

CE 433: Embedded Devices

4 Credits

(Lectures/Labs)

Land Acknowledgement: "We acknowledge the land that Fort Lewis College is situated upon is the ancestral land and territory of the Nuuchiu (Ute) people who were forcibly removed by the United States Government. We also acknowledge that this land is connected to the communal and ceremonial spaces of the Jicarilla Abache (Apache), Pueblos of New Mexico, Hopi Sinom (Hopi), and Diné (Navajo) Nations. It is important to acknowledge this setting because the narratives of the lands in this region have long been told from dominant perspectives, without full recognition of the original land stewards who continue to inhabit and connect with this land. Thank you for your attention and respect in acknowledging this important legacy."

Instructor: Dr. Yiyan Li, yli@fortlewis.edu

Lectures: Tuesday & Thursday: 08:00 – 09:25 am in BH570

Labs on Tuesdays: 2:30 - 5:35 pm, SFH760

Office Hours: Monday/Wednesday, 9:00 – 12:00 am in BH601, 1/12/2026 – 4/24/2026

Course webpage

Dr. Li's webpage

Course Description:

This course focuses on modern methods of digital circuit and chip design using Hardware Description Language (HDL), with an emphasis on simulations and hands-on emulation on Field Programmable Gate Arrays (FPGAs). The course begins with the fundamentals of Verilog and progresses to the design and verification of digital blocks. These blocks include basic combinational and sequential circuits, GPIOs, interfaces with on-board display modules, switches, and buttons, as well as components such as VGA ports, UART, soft CPU cores, USB, SPI, ADCs, and SoCs. A final project at the end of the semester will integrate the technologies, tools, and design strategies covered throughout the course, allowing students to apply their knowledge in a comprehensive project.

Course Materials & Resource

Required Text:

Digital System Design with FPGA, Implementation using Verilog and VHDL. Cem Unsalan & Bora Tar. ISBN: 978-1-25-983791-3

FPGA Prototyping by Verilog Examples: Xilinx Spartan-3 Version. Pong Chu. ISBN-100470185325

Course weekly plan

Week 1: FPGA and Verilog Basics

Week 2: Data Types

Week 3: Combinational Logic Blocks

Week 4: Data Storage Units

Week 5: Sequential Circuit Design

Week 6: VGA and midterm exam

Week 7: UART

Week 8: Soft Core

Week 9: USB

Week 10: Spring Break

Week 11: SPI

Week 12: XADC

Week 13: The 6502 SoC

Week 14 and Week 15: The Course Project

Student Course Learning Objectives

After completing CE 433 students will be able to:

- Design a digital system for automatic control. (1, 2)
- Program microcontrollers for data acquisition. (1, 2, 6)
- Perform signal processing for digital discrete data. (1, 2, 6, 7)
- Design combinational and sequential logic circuits. (1, 2)
- Use FPGA for digital logic design. (1, 2)
- Analyze the real-world problems and translate them into digital hardware description languages. (1, 2)
- Manage a digital design/verification project. (1, 2)
- Master the code of computer engineering ethics. (4)
- Be proficient at oral communication and writing. (3)
- Behave professionally on a team. (5)

Engineering Program Student Learning Outcomes (ABET criteria)

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural social, environmental, and economic factors.

3. an ability to communicate effectively with a range of audiences.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Grading Policies

70% Homework/Quizzes/Labs

10% Midterm Exam

20% Final Course Project

Grading Scale by %:

Letter Grade	Point Range
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	0-59

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3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Policies

Attendance

Attendance is defined to be: in class on time, in class for the duration of the class period, prepared for the day's topic, participation in class.

Disenrollment Policy

You will be disenrolled from this course if you miss the first day of class and the first laboratory session. If you are disenrolled from the class, you may re-register if space is available.

Course Withdrawal Information

Withdrawal from Course – See Registrar's Office website. The date is a college-wide deadline that is not negotiable.

To withdraw from this course, go to the Registrar's Office, Room 160, Miller Student Services Building before the course withdrawal deadline. They will help you through the process. You do not need my signature on the course withdrawal request form.

Starting Fall 2013, students have a lifetime limit of three individual course withdrawals from FLC courses. If you have withdrawn from classes before Fall 2013, these will not count towards your lifetime limit. Also, withdrawing entirely from a semester (all classes) does not count against your lifetime "CW" limit. Semester withdrawal is handled under a different policy and procedure. Please refer to the Academic Policies section of the Fort Lewis College Catalog of Courses for more information about the course and semester withdrawal policies and procedures.

Canvas

Online materials (lecture notes, homework assignments, quizzes) will be available at Canvas or on the professor's course webpage. If you are not familiar with Canvas, please work through the Student Canvas Orientation. For technical help with Canvas contact the 24/7 support hotline at 855-971-1611 or submit a HELP ticket in Canvas.

Course Expectations

Credit Hour Syllabus Statement

In addition to spending 3 hours per week attending class, the typical student in this 4 credit lecture course/labs should expect to spend at least 6 hours per week of concentrated attention on course-related work, including but not limited to time spent reading, reviewing, organizing notes, preparing for upcoming quizzes/ exams, problem solving, developing and completing projects, and other activities that enhance learning.

Academic Integrity

Academic dishonesty includes all forms of unethical or illegal behavior which affects a student's academic standing, including, but not limited to, cheating on exams, plagiarism, forgery of academic documents, falsification of information on academic documents, or unauthorized access to computer files containing academic information. Academic dishonesty may result in sanctions ranging from a lowered grade on a particular assignment to an "F" in the class and report submitted to the Office of the Vice President of Academic Affairs.

****"Fort Lewis College is committed to providing all students a liberal arts education through a personalized learning environment. If you think you have or you do have a documented disability which will need reasonable academic accommodations, and/or if you are a Veteran who may need services, please contact the Disability Services Office, 280 Noble Hall, 970-247-7383, disabilityservices@fortlewis.edu for an appointment as soon as possible."