

ECE/CS 3710 Computer Design Laboratory

Credits and Contact Hours: 3.0 Credit Hours

15 weeks: Two 80-minute lectures per week for first 5 weeks then project team meetings for the rest of the semester.

Instructor's Name: Chris Myers

Text Book(s) and/or Required Material:

- None – Project notes are distributed

Catalog Description: Working in teams, students employ the concepts of digital logic design and computer organization to design, implement and test a computing system. Interface IO devices and develop associated software/firmware. Extensive use of CAD and software tools.

Prerequisites:

- C- or better in ECE or CS 3700: Fund. of Digital System Design; **and**
- C- or better in ECE or CS 3810: Computer Organization; **and**
- Full major status in Computer Science or Computer Engineering

Designation: Elective

Contribution of Course to Meeting the Requirements of ABET Criterion 5: Engineering sciences and engineering design: This course is primarily concerned with detailed computer engineering design and documentation.

Specific Outcomes of Instruction:

1. The objective of the class is to design, build, and test a simple computer.

Relationship of the Course to the Program Outcomes:

- (a) *An ability to apply knowledge of mathematics, science, and engineering.* This clearly underlies the activities in this course, but it is not a fundamental outcome of this course.
- (c) *An ability to design a system, component, process or software package to meet desired needs.* This is the fundamental outcome of this course, since the primary objective is to design a digital hardware system with associated software to implement a desired application.
- (d) *An ability to function on multidisciplinary teams.* A team of 3 or 4 students executes the system designed in this course, so teamwork is crucial to the execution of this project. While the students are mostly computer engineers, there are also electrical engineering and computer science students in the course. Even in a team all from the same major, each team usually has students who focus on hardware or software depending on their skills and background.

- (e) *An ability to identify, formulate and solve engineering problems.* The majority of the problems that the teams must solve to complete their project are design and CAD tool issues, not detailed electrical issues. However, interfacing their projects to peripheral devices requires understanding the electrical engineering issues involved in the connection.
- (g) *An ability to communicate effectively in written and oral form.* A significant documentation requirement is included in the project. The teams must generate final reports in conference-paper formats, and include appendices with detailed design documentation. In addition, an end-of-semester “demo day” is held where all teams demo their projects to the students and faculty of the college of engineering. This has evolved into a fairly large and well-attended event.
- (k) *An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.* Students use commercial CAD tools throughout the course from Xilinx and make heavy use of the verilog hardware description language. Use of these tools for design synthesis, simulation, and implementation are a core part of this course.

Topics Covered in the Course:

- Computer instruction sets
- Computer arithmetic
- Assembly language programming
- Digital design
- Computer architecture
- Input/output architectures
- Memory architectures
- CAD tool use
- FPGA implementation strategies
- Design skills
- Team project skills
- Documentation skills