ECE 441/541 (Elective)
Advanced Digital Design andField Programmable Gate Arrays
Spring 2016

Course (catalog) description:

Course will provide a description of FPGA technologies and the methods using CAD design tools for implementation of digital systems using FPGAs. It provides advanced methods of digital circuit design, specification, synthesis, implementation and prototyping. It introduces practical system design examples. (Offered spring)

Prerequisites: ECE 341 or equivalent
Corequisites:

Texbook(s) and/or other required materials:

Digital Systems Design Using VHDL, Second Edition, by Charles Roth and Lizy John (Recommended)
Advanced FPGA Design, Kilts , 2007 (Suggested)
Others: TBD

Course Learning Objectives:

1. Students will be able to design, specify, synthesize, simulate, and implement advanced digital systems on FPGAs.
2. Students will understand current applications and trends in FPGA technology.
3. Students will learn advanced VHDL programing techniques.
4. Students will develop, implement, and prototype a complex digital system.
5. Students will develop functional hardware modules and integrate them into a complete system.
6. Students will make use of external peripherals devices in their design projects.
7. Students will learn advanced code debugging, and hardware troubleshooting methods.
8. Students will have completed a major project that involves identifying, formulating, and solving a complex engineering problem.

Course Outline:

I. Course Introduction (1 lecture)
  A. Course Overview
  B. Course Format and Procedures
II. Survey of FPGA Technologies (4 lectures)
  A. History and trends
  B. FPGA technologies
  C. Designing with FPGAs
III. Introduction to Advanced VHDL for FPGA design flow (6 lectures)
  A. VHDL Review
  B. VHDL Programming models
  C. FPGA Design flow
  D. Advanced VHDL concepts
IV. FPGA Design Methodologies (6 lectures)
  A. Design synthesis
  B. Functional simulation
  C. Design fitting

D. Timing analysis and simulation
E. Device programming and configuration

V. Advanced Digital Design (6 lectures)
A. Module design and prototyping
B. Component interfacing
C. Complex system component integration
D. Built-in logic analysis
E. Complete system analysis

VI. Summary (1 lecture)

Grading (ECE 441):

50% laboratory assignments
Five lab equally weighted assignments
Work in pairs. For each lab, work with different partner
20% Midterm exam
30% Final project

Grading (ECE 541):

40% laboratory assignments
Five lab equally weighted assignments
Work in pairs. For each lab, work with different partner
20% Midterm exam
25% Final project
15% Term paper

Academic Integrity:

Learning requires a conscientious effort in order to attain and demonstrate mastery. Unless otherwise directed, students are required to submit their own work for homework, programming assignments, tests/exam, and project assignments. Please see https://www.odu.edu/facultystaff/teaching/conduct-integrity more details.

Accommodations:

Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester.

Class Schedule: MW 3:00-4:15
Each class is 75 minutes in duration.
Engineering Science Hours: 1 Engineering Design Hours: 2
Prepared by: Lee Belfore
Signature and Date: _____