

CDA 4253 FPGA System Design

Instructor: Dr. Hao Zheng

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Office Hour/location: 2 – 4pm, or by appointment.

Class Meeting Time/Location: Tue., Thr., 11 : 00am – 12 : 15pm at SOC 304.

Credit Hours: 3

Course Description: This course introduces fundamentals and circuit architectures of field programmable gate arrays (FPGAs), design tools supporting FPGA-based system designs, and their applications in reconfigurable computing. It provides experience of designing system with FPGAs. The applications of FPGAs in various custom computing environments will also be examined.

Prerequisites:

- CDA 3201/3201L Computer Logic and Design/Lab
- CDA 4205 Computer Architecture
- CDA 4203/4203L Computer System Design/Lab

Some knowledge on CMOS VLSI circuits is desired.

Objectives: The goal is to enable student to design and implement custom computing systems with FPGAs. Students will gain knowledge and understanding of

- Different technologies to implement digital systems.
- FPGA architectures.
- Design software supporting designs with FPGAs.
- The FPGA design tools.
- The reconfigurable computing systems and the roles of FPGAs in those systems.

Textbook: *Reconfigurable Computing* by Scott Hauck and Andre Dehon, Morgan Kaufmann, 2008, ISBN: 978-0-12-370522-8.

Main Topics:

- Fundamentals of FPGA architectures.
- FPGA placement and routing.
- FPGA configuration.

- Reconfigurable computing architectures
- Applications of reconfigurable computing.
- High-level compilation
- Hardware/Software partitioning.

Project: Students will form teams of two or three, and each team will design and implement a computing system using FPGAs. Each team has the freedom to select a project subject to instructor's approval. Each team needs to submit a project proposal describing the design, a plan of how to finish the design, and expected results. At the end of the semester, each team needs to submit a final report describing the experimentation, obtained results and discussion, and problems encountered during the project and the solutions. Each team also needs to give a 30 minute oral presentation to report the project in front of the class.

Grading:

- Homework/Lab assignments: 30%.
- Mid-term: 30%.
- Final project: 40%.

Grading Scale: above 90% – *A*, above 80% – *B*, above 70% – *C*, above 60% – *D*, below 60% – *F*.

Communication: Blackboard will be the sole means for communications. Grades, hand-outs, and other related materials will be posted only on Blackboard.

Policy for Exam and Assignments: Late submission of assignments and the make-up exam are granted only when a police report or a doctor's note showing some emergency is presented.

Academic Integrity/Academic Dishonesty: Students are expected to be honest and not cheat on their assignments/examinations/project. Collaboration and discussion with fellow students are highly encouraged, but copying each other's work is forbidden. Every student should read the University's policies on student conduct, academic dishonesty, etc. Please see the University's Undergraduate Catalog regarding these policies at <http://www.ugs.usf.edu/catalogs/0607/adadap.htm>. Students caught cheating in any form will receive an **FF** grade for the course.

Last Day to Drop with 'W': November 1.