CDA 4253 FPGA System Design

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Office Hour/location: 4 – 5pm Mon. and Wed., or by appointment.  
Class Meeting Time/Location: Tue., Thr., 5:00pm – 6:15pm at CIS 1016.  
Credit Hours: 3

1 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. Students will gain hands-on experience of designing system with FPGAs, and learn the basics of design tools targeted for FPGA based designs. The applications of FPGAs in various custom computing environments will also be examined.

2 Prerequisites

Prerequisite(s) shown in the catalog: CDA 3201/3201L Computer Logic and Design/Lab. However, knowledge on CMOS VLSI circuits and computer architecture are highly desired.

3 Objectives

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

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

4 Textbook

5 Main Topics

This is a tentative list of topics to be covered subject to change.

- Comparison of different computing methods
- Fundamentals of FPGA architectures
- Introduction to VHDL
- FPGA placement and routing
- FPGA configuration
- Reconfigurable computing architectures
- Applications of reconfigurable computing
- High-level compilation
- Hardware/Software partitioning

6 Project

Students will form teams of no more than 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 20 minute oral presentation to report the project in front of the class.

7 Evaluation

Each student is evaluated based his/her performance on homework/labs, mid-term exam and the final project. The distribution of grades is shown as follows.

\begin{itemize}
\item Homework/Lab assignments 30%.
\item Mid-term 30%.
\item Final project 40%.
\end{itemize}

Final grading Scale:

\begin{itemize}
\item \(A\) : \(\geq 90\%\)
\item \(B\) : \(80\% - 89.9\%\)
\item \(C\) : \(70\% - 79.9\%\)
\item \(D\) : \(60\% - 69.9\%\)
\item \(F\) : \(< 60\%\)
\end{itemize}
8 Communication

Blackboard will be the sole means for communications. Grades, handouts, and other related materials will be posted only on Blackboard. The following three locations on Blackboard will be used very often during this semester.

- **Course Document** where lecture material and other related documents are posted
- **Assignments** where assignments are posted and your solutions are submitted. *Anything sent to Digital Dropbox is ignored.*
- **Grade Book** where grades for assignments, exam(s), and the final project are posted.
- **Discussion Board** where questions and answers that are of interest to the entire class are posted.

In addition, your email inbox needs to be cleared because messages broadcast to the whole class will be sent out via announcements and/or emails. *You are responsible for not receiving emails due to the overflow of your email inbox.*

9 Policy for Missing Exam and/or 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.

10 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/pdf/cat1011/20102011.pdf](http://www.ugs.usf.edu/pdf/cat1011/20102011.pdf). Students caught cheating in any form will receive an **FF** grade for the course.

11 Last Day to Drop with ’W’: March 27

12 General Policies

- All announcements and assignments will be posted through Blackboard. Students are required to look in Blackboard for course material and related information.
• Class Attendance is required although not monitored. Students are responsible for all information communicated during class. This information will not be necessarily duplicated in the class webpages.

• Academic dishonesty will not be tolerated and the student, in question, will be dealt with in accordance with the University policies.

• Cell phones may not be used as calculators. Cell phones must be turned off at all times including exams and lectures.

• The communication functions including text messaging on all devices must be turned off during exams.

• Students are not allowed to sell or distribute notes provided for this class.

• Students with disabilities are encouraged to consult the Instructor as soon as possible. If accommodations are needed, a letter from the Office of Student Disability Services (SVC 1133) will be required. Please inform the Instructor if there is a need for alternate format for documents or notetaker.

• Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) in writing by the second class meeting.

• The instructor reserves the right to interpret the class policies if confusions may occur.