Cleveland State University
Department of Electrical Engineering and Computer Science

EEC 587 Rapid Digital System Prototyping

Catalog Data: EEC 587 Rapid Digital System Prototyping (2-4-4)

Prerequisite: EEC580
Partition, design and implementation of hardware and software concurrently; including experiments and projects utilizing VHDL, EDA software tools and FPGA devices to design, synthesize, simulate, implement and test advanced digital systems with soft-core processor and hardware accelerators.

Textbook: *Embedded SoPC Design with Nios II Processor and VHDL Examples*
by P. Chu, John Wiley, 2011

Course Coordinator: Dr. Pong P. Chu,
Associate Professor of Electrical Engineering and Computer Science.

Course Objectives: Analyze, design, implement, and test hardware and software concurrently with FPGA devices.

Expected Outcomes: Upon completion, students should be able to
- Design, verify, implement and test system with soft-core processor
- Design, verify, implement and test custom I/O peripherals
- Design, verify, implement and test hardware accelerators

Fulfillment of EE and CE Program Objectives and Outcomes

Objectives:
1. practice computer engineering
2. define and diagnose problems, and provide and implement computer engineering solutions in an industrial environment
5. collaborate with others as a member or as a leader in an engineering team

Outcomes:
(a) an ability to apply knowledge of mathematics, science, and engineering to computer engineering
(b) an ability to design and conduct computer engineering experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(e) an ability to identify, formulate, and solve electrical computer problems
(k) an ability to use the techniques, skills, and modern engineering tools necessary for computer engineering practice.

Prerequisites by Topic:
- VHDL,
- Computer organization
- C/C++ language
**Course Outline:**

**Major Course Topics:**
- Design partition and hierarchy (6)
- Clock and synchronization (3)
- Nios 2 soft-core processor (4)
- Serial interface (3)
- Video interface (3)
- Hardware-accelerator (6)
- Interrupt and scheduling (3)
- Case study: sound processor (9)
- Test (3)

**Total hours** (40)

**Major Lab Topics**
- Introduction to software tool (2)
- Introduction to soft-core processor (2)
- IP cores integration of soft-core processor (2)
- Keyboard interface (2)
- Graphic video controller (3)
- Direct frequency synthesis (2)
- Sound processor (2)
- Project (5)

**Total equivalent lecture hours** (20)

**Computer Usage:** EDA software will be used in homework and lab experiment for VHDL entry, synthesis and simulation

**Prepared by:** Pong P. Chu

**Date:** February 2015