EEC 488: Hardware-Software Co-design

Catalog Data: EEC 488 Hardware-Software Co-design (2-2-3)
Pre-requisite: EEC 487
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.


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
1. Design, verify, implement and test system with soft-core processor
2. Design, verify, implement and test custom I/O peripherals
3. 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.

Contribution of Course to Meeting the Professional Component:
Math & Basic Science: 0 credit;
Engineering Topics: 3 credits;
General Education: 0 credit
Prerequisites by Topic:
VHDL, Computer organization, Operating system, C language

Topics:

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
- Test 2
Total hours 30

Major Lab Topics:
- Introduction to software tool 2
- Introduction to Nios 2 processor 2
- IP cores integration of Nios 2 processor 2
- Keyboard interface 2
- Graphic video controller 3
- Direct frequency synthesis (DFS); two-week experiment 4
Total equivalent lecture hours 15

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

Laboratory Projects: None

Prepared by: Pong P. Chu
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