**Course**  
ECE 43700 - Computer Design and Prototyping  

**Type of Course**  
Required for CmpE Program, Elective for EE Program  

**Catalog Description**  
An introduction to computer organization and design, including instruction set selection, arithmetic logic unit design, datapath design, control strategies, pipelining, memory hierarchy, and I/O interface design.  

**Credits**  
4  

**Contact Hours**  
Class: 3; Lab: 3  

**Prerequisite Courses**  
ECE 35800, ECE 36200  

**Prerequisites by Topics**  
Familiar with Hardware Description Language (VHDL or Verilog) and microprocessor system organization  

**Textbook**  

**Course Objectives**  
Computer design is the science and art of selecting and interconnecting hardware components to build a computer that meets functional, performance, and cost goals. In this course, students will learn to design a uniprocessor computer system, including processor datapath, processor control, memory systems, and I/O. The course provides a thorough and detailed treatment of basic computer arithmetic algorithms, multi-cycle implementations of modern computer instruction sets, pipelined CPU designs, design of cache hierarchy and virtual memory, and fundamentals of computer system I/O. The course also includes evaluation and analysis of processor and memory performance.  

**Course Outcomes**  
Students who successfully complete this course will have demonstrated:  
1. An understanding of basic computer arithmetic algorithms. (a [1], c [2], e [4])  
2. An ability to understand and implement single-cycle implementations of a computer instruction set. (a [1], c [2], e [4])  
3. An ability to understand a pipelined CPU. (a [1], c [2], e [4])
4. An ability to analyze and evaluate CPU performance. (a [1], b [2], e [3])

5. An experience with the design, simulation, and documentation of a single-cycle CPU using modern CAD tools. (a [1], b [2], c [3], e [6], i [8], k [9])

Lecture Topics
1. Computer Abstractions and Technology
2. Instructions: Language of the Computer
3. Arithmetic for Computer
4. The Processor: Datapath and Control
5. Memory Hierarchy
6. Storage and Other I/O topics
7. Multicores, Multiprocessors, and Clusters

Computer Usage
High

Laboratory Experience
High

Design Experience
High

Coordinator
Guoping Wang, Ph.D.

Date
31/3/11