<table>
<thead>
<tr>
<th>Course</th>
<th>ECE 43700 - Computer Design and Prototyping</th>
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<tr>
<td>Type of Course</td>
<td>Required for CmpE Program, Elective for EE Program</td>
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<tr>
<td>Catalog Description</td>
<td>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.</td>
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<td>Credits</td>
<td>4</td>
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<td>Contact Hours</td>
<td>Class: 3; Lab: 3</td>
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<td>Prerequisite Courses</td>
<td>ECE 35800, ECE 36200</td>
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<td>Prerequisites by Topics</td>
<td>Familiar with Hardware Description Language (VHDL or Verilog) and microprocessor system organization</td>
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<td>Course Objectives</td>
<td>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.</td>
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| 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**

03/02/2018