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| **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** | *Computer Organization and Design: The Hardware-Software Interface*, J.L. Hennessy and D. A. Patterson, Morgan Kaufmann Publisher, latest edition |
| **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 ability to analyze and evaluate CPU performance (2) 2. an ability to understand basic computer arithmetic algorithms, such as multiplication, floating operations, etc. (1) 3. an ability to convert simple high-level programming language codes into assembly languages (2) 4. an ability to understand the principles of a single clock cycle CPU (1) 5. an ability to implement and simulate a single clock cycle CPU (6) 6. an ability to understand the principles and practices of pipelined CPU (1) 7. an ability to understand the concepts of memory hierarchy, such as cache, virtual memory. (2) 8. an ability to use modern electronic design automatic (EDA) tools (7) |
| **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** | 09/11/2018 |