ECE 341: Introduction to Computer Hardware

Catalog Description

An overview of computer architecture and programming from a hardware viewpoint. Topics covered include: digital logic; arithmetic operations; pipelining; CISC/RISC; memory hierarchy; virtual memory; input/output techniques; computer system components. This course may not be used towards degree requirements for an electrical engineering or a computer engineering baccalaureate degree.

Credit hours: 4

Goals

This course introduces non EE/ECE students to computer architecture and covers digital design, computer organization (through development of a simple pipelined microprocessor), memory systems, and input/output devices.

Course Coordinator and Committee

Mark Faust
Garrison Greenwood
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Textbooks

Computer Organization and Design: The Hardware/Software Interface, Patterson and Hennessy, 2014, 5th.

The course instructor may choose to use a different textbook. Please check with your instructor before purchasing.

Prerequisites

CS 201

Learning Outcomes

At the end of this course, students will be able to:

1. Knowledge of the software and hardware interface and how a programmer can improve performance.
2. Knowledge of forces that drive the development of new computer architectures and design.
3. Ability to interpret different performance criteria used to make design decisions.

4. Ability to write machine descriptions at the register-transfer level that can execute instructions.
5. Understanding of what decisions must be made to develop a successful HW/SW system design.

Topical Outline

- Introduction: Context, architecture concepts, manufacturing technology, trends. Representation of information.
- Performance/Power: Measurement, MIPS Architecture: Instruction set, software conventions.
- Logic Design:Gates, combinational logic, HDL, Clocks, memory elements, flip-flops, registers.
- Arithmetic Design: Constructing a basic ALU, faster addition, add, sub, mul, div, FP.
- Processor Design: Datapath, single cycle, simple design.
- Multicycle Design: Microcided designs.
- Review. Midterm
- Pipelining: Instruction, data and control hazards
- Memory: Caches, virtual memory, memory hierarchy.
- Input/Output Basics: Communication, interfaces, interrupts, devices, error checking
- Parallel Processing: SIMD, MIMD, multithreading, multicore, GPU, network
- Course Review/Advanced Designs

Course Structure and Grading Criteria

The course holds two 90 minute weekly lectures.

Course grades are based on homework assignments, midterms, and a final exam. Grading criteria may vary with instructor. Please refer to the instructor's syllabus for to see the grading breakdown (i.e., percentage weight for each category) and the grading scheme.

Prepared by: Tom Schubert, updated by Christof Teuscher

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