CS 2190: COMPUTER ORGANIZATION

Semester Hours: 3.0                  Contact Hours: 3
Coordinator: Tianyi Song
Text: Computer organization and design: HW/SW Interface
Author(s): PATTERSON AND HENNESSY
Year: 2014, 5th edition

SPECIFIC COURSE INFORMATION

Catalog Description:

Course type: REQUIRED

SPECIFIC COURSE GOALS

- I can explain the fundamental concepts of computer organization.
- I can use different data representations.
- I can design basic circuits using logic gates and flip-flops.
- I can utilize an assembler tool to write and execute simple assembly language programs.
- I can explain the data and control hazards in designing instruction sets for pipelining.
- I can explain basic instruction-level parallelism methods.
- I can explain how the different memory units work in the memory hierarchy.

STUDENT OUTCOMES ADDRESSED BY THIS COURSE

- B.1 Analyze a given problem, and identify and define the computing requirements appropriate to its solution.
- B.3 Apply mathematical foundations, algorithmic principles, and computer science theory as appropriate in modeling and solving real-world problems.
• B.8. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

LIST OF TOPICS COVERED

• (0.5 weeks, ~3%) Overview of Computer Design
  o Building blocks
  o Functional point of view
• (1.5 weeks, ~11%) Data Representations
  o Numeric representations
    ▪ Codes, arithmetic, addition/subtraction, 2's complement, floating-point numbers
  o Character representations
• (2.0 weeks, ~14%) Assembly language
  o MIPS assembly language
  o Simulator
• (2.0 week, ~14%) Logic Design
  o Gates, truth tables, logic equations, don't care terms
  o Combinational logic
  o Basic arithmetic logic unit
  o Flip-flop (D flip-flop)
• (1.5 weeks, ~11%) Instruction Representation
  o Operation, operand
  o Instruction format
  o Addressing modes
  o Decision-making
  o Procedure/function calls
• (2.5 weeks, ~17%) Control & Data Flow
  o Structures
- Control unit
- Data path, data and control hazards
- Forwarding, stalls, exception, interrupt
- (2.0 weeks, ~14%) Introduction to Instruction-level Parallelism
  - Multiple-Issues
  - Speculation
  - Loop Unrolling
- (1.0 weeks, ~7%) Memory Hierarchy Fundamentals
  - Memory hierarchies
  - Measuring performance
- (1.0 weeks, ~7%) Multiple Processor Systems
  - Multicores, multiprocessors; clusters