CS 2190 : COMPUTER ORGANIZATION

Semester Hours: 3.0
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

• Overview of Computer Design (0.5 weeks, ~3%)
  o Building blocks
  o Functional point of view
• Data Representations (1.5 weeks, ~11%)
  o Numeric representations
    ▪ Codes, arithmetic, addition/subtraction, 2's complement, floating-point numbers
  o Character representations
• Assembly language (2.0 weeks, ~14%)
  o MIPS assembly language
  o Simulator
• Logic Design (2.0 week, ~14%)
  o Gates, truth tables, logic equations, don't care terms
  o Combinational logic
  o Basic arithmetic logic unit
  o Flip-flop (D flip-flop)
• Instruction Representation (1.5 weeks, ~11%)
  o Operation, operand
  o Instruction format
  o Addressing modes
  o Decision-making
  o Procedure/function calls
• Control & Data Flow (2.5 weeks, ~17%)
- Structures
- Control unit
- Data path, data and control hazards
- Forwarding, stalls, exception, interrupt

- Introduction to Instruction-level Parallelism (2.0 weeks, ~14%)
  - Multiple-Issues
  - Speculation
  - Loop Unrolling

- Memory Hierarchy Fundamentals (1.0 week, ~7%)
  - Memory hierarchies
  - Measuring performance

- Multiple Processor Systems (1.0 week, ~7%)
  - Multicores, multiprocessors; clusters