

# COMP4300 Computer Architecture

Fall 2010

Auburn University

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## Study Guide for the Final Exam

The midterm exam will occur on **Thursday, Dec. 9th**. This exam is closed book and closed notes. The exam is worth 20% of your final grade. Although a calculator is not necessary to complete the exam, you may bring a calculator with you. Please do not bring a laptop with sensitive information on computer architectures.

A list of **general advice** about studying for the exam is to aim for understanding over memorization.

1. Study the quizzes we have taken.
2. Go through the written assignments.
3. Review the course notes to see what was emphasized in the lectures.
4. You should be familiar with the core set of instructions, their use, the three types of formats.

In what follows, you will find a guide of **topics** that may be covered in the midterm exam. Note that questions pertaining to any of these topics may appear on the midterm exam.

- Pipelining: Exceptions
  - Interrupts
  - Traps
  - Exceptions in five-stage pipeline
  - Exception detection (not covered)
  - Exception handling
  - Stop the offending instruction
  - Flush instructions following the offending instructions

- Save the address of the offending instruction, and
  - Jump to a prearranged exception handler code
- Pipeline: Control
  - Pipelined Datapath with Control Signals
  - Control for Pipelined Datapath
- Instruction-level parallelism - Introduction
  - Forms of Parallelism
  - Instruction Level Parallelism-Basic idea
  - The Big Picture
  - Dependencies
  - ILP Challenges
- Instruction Dependence
  - Data Dependence and Hazards
  - Name Dependences
  - Dependences and hazards
  - Dependency graph
  - Control Dependencies
  - Preserving the data flow
  - Speculation
- Scoreboard
  - The Key idea of Dynamic Scheduling
  - Dynamic Scheduling with a Scoreboard
  - The Key idea of Scoreboards
  - Typical Scoreboard Structure
  - Using a Scoreboard: 4 stages
  - A Scoreboard Example
  - Limitations of Scoreboard
- Tomasulo
  - Register Renaming
  - Tomasulo Organization
  - Three Stages of Tomasulo Algorithm

- Reservation Station Components
- Tomasulo Example
- Tomasulo - A loop example
- Tomasulo Drawbacks
- Memory Hierarchy and Cache Design
  - Memory Systems - the Big Picture
  - Cache Operation
  - Cache Performance Measures
  - Block Placement – Basic idea
  - Direct Mapped Block Placement
  - Fully Associative Block Placement
  - Set-Associative Block Placement
  - Replacement Algorithms