**Topics**

1. Computer Architecture Basics, Instruction Set Design Principles (Chapter 1 and Appendix A)
   1. Computer Architecture definition, System Design Parameters
   2. Classes of computers
   3. Power and Energy, Cost of IC, wafer, die, yield
   4. RISC vs. CISC
   5. Different types of architectures
   6. Address alignment, Addressing modes
   7. Instruction Encoding (Fixed vs. Variable)
2. Performance Measurement (Chapter 1)
   1. Execution Time & Speedup
   2. Amdahl’s Law
   3. CPI, Bandwidth / Throughput, Latency / Response Time
3. Memory Hierarchy (Chapter 2, Appendix B)
   1. Need for memory hierarchy
   2. Locality principles
   3. Direct, n-way, full-associative cache organizations
   4. Write through, Write back schemes
   5. Cache performance
   6. Basic cache optimizations
   7. Advanced cache optimizations
   8. Virtual Memory
4. Instruction-Level Parallelism, Basic Pipelining (Chapter 3 Secs. 3.1, 3.2, 3.3, Appendix C)
   1. Pipeline diagram, Pipeline performance (ideal speedup)
   2. Pipeline implementation
   3. Structural, Control, and Data hazards (identification and fixing the hazards)
   4. Control hazards – static branch prediction, dynamic branch prediction, branch-prediction buffers.
5. RISC-V architecture (Section A.9)
   1. Registers, Data Types, Instruction Format
   2. RISC-V Operations
   3. Control-flow instructions, FP instructions

**Review**

* Monday, 3rd March
* Review all slides and homeworks
* Review example problems in the textbook

**Exam Format**

Time: 5:00 pm – 6:15 pm (75 min)  
Where: Classroom (in person).   
Closed Notes and Closed Text.  
A formula sheet will be provided.

You need to answer all questions. Each question carries 10 pts each.

1. Fill in the blanks / True or False questions (10)
2. Multiple choice questions (10).

Note: More than one choice may be correct. Credit only if you select all correct choices.

1. Technology Trends, Performance Measurement (Topics 1, 2)
2. Memory Hierarchy (Topic 3)
3. Basic Pipelining and RISC-V Architecture (Topics 4, 5)