New York University Tandon School of Engineering
Electrical and Computer Engineering
Course Outline ECE 6913 [Computing Systems Architecture]
Fall 2018
Professor Siddharth Garg

Thu 12.25 PM - 2.55 PM at RGSH 215
Fri 12.25 PM - 2.55 PM at JABS 474

To contact professor: **sg175@nyu.edu**
2 Metrotech, 10.076
Office hours: **Wednesday 3PM-4PM** or by appointment

Course Pre-requisites Basic knowledge of digital logic and computer organization is assumed. ***Class projects will require knowledge of C/C++ programming***. If you do not have *any* prior programming experience, the class is not recommended.

Course Description A uniprocessor computer is built from the blocks developed. An assembly language and an instruction set are presented. Processor implementation with a data path and hardwired and microprogrammed control is introduced. Performance evaluation of computers is studied. Basic pipelining is introduced to improve system performance. Memory-hierarchy alternatives are introduced to improve the capacity of the computing system. Techniques to exploit instruction level parallelism will be studied.

Detailed Syllabus

Week	Content	Labs
1 06/09 07/09	Introduction: ISAs and their evolution. ISA features and impact on architecture	
2 13/09 14/09	Lab 0 to be completed in-class with TA assistance	Lab 0: Functional ISA Simulator
3 20/09 21/09	Basics of MIPS ISA	Lab 1: Pipelined MIPS simulator
4 27/09 28/09	Single-cycle MIPS design	
5 04/10 05/10	5-stage MIPS pipeline: basic	
6 11/10	5-stage MIPS pipeline: handling dependencies	Lab 2: Cache simulator

12/10		
7 18/10 19/10	Memory subsystem: Caches	
8 25/10 26/10	Advanced Cache concepts and Virtual Memory	
9 01/11	Out-of-order execution: Tomasulo's algorithm	NOTE: This lecture will be conducted on Thurs. for *both* sections
9 **02/11**	MIDTERM	NOTE: Midterm will be conducted on Friday for both sections
10 08/11 09/11	Out-of-order execution: advanced concepts	
11 15/11 16/11	Branch prediction	
12 29/11 30/12	Main memories and prefetching	
13 06/12 07/12	Data-flow Architectures: Hardware to Accelerate Machine Learning	
14 **13/12**	Review	NOTE: Review session will be conducted on Thurs. for *both* sections
14 **14/12**	Final Examination	NOTE: Final examination will be conducted on Friday for both sections.

Readings

There is no required textbook for the course, but students might find the following book useful for reference:

John L. Hennesy and David A. Patterson, "Computer Architecture: A Quantitative Approach" [5th Edition], Morgan Kaufmann.

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