Syllabus

CS 7290 – Advanced Microarchitecture

Spring 2014

Description

This post-CS4290/6290 course focuses on advanced microarchitecture-level studies of modern and future high-performance microprocessors. We will cover low-level implementation details, design concepts, engineering decisions, power/performance/complexity/reliability tradeoffs, and other aspects of creating processors. We will also include several case-studies of real processor designs from Intel, AMD, IBM, etc. The course format will consist of normal lectures, homework, student presentations of real-world case studies, two midterm exams, a significant project component (with presentations), and a final exam.

Prerequisites

CS4290/CS6290 or an equivalent "Hennessy and Patterson: A Quantitative Approach" course. Note that a CS2200-type course, which uses "Patterson and Hennessy: The HW/SW Interface", is not considered to be sufficient preparation for this course.

Time and Location

Tuesdays and Thursdays
3:00-4:30pm
CCB 102

Instructor

Milos Prvulovic
milos at cc dot gatech dot edu

Office Hours

Klaus 3223
Time to be decided during first lecture (in discussion with students)

Textbook

There is no required textbook for this class, but textbooks that might be helpful are "*Modern Processor Design: Fundamentals of Superscalar Processors*" by John Paul Shen and Mikko Lipasti, which covers a lot of the material taught in this class, and "*The Pentium Chronicles*" by Robert P. Colwell, which provides excellent insight into the design process for real processors.

Attendance Policy

You will be required to show up for the midterm and final exam, and for your assigned project and real-world processor presentations. However, you are strongly encouraged to attend all lectures - it will be very, very hard to do well on exams if you miss a significant number of lectures.

Collaboration, Cheating, etc.

Absolutely no collaboration is allowed with *anyone* on any assignments, except when a group for a specific project or assignment is explicitly authorized by the instructor. Note that any plagiarism, unauthorized collaboration, or any other violation of class policies is a violation of the Georgia Tech Student Honor Code and *must* be reported by the instructor to the Office of Student Integrity.

Grading

Term Project	30%
Exams	45% (two midterms and final, equally weighted)
Participation	10% (based on case study presentations and discussion)
Homework	15%

Tentative Schedule

Week	Date	Topics	Notes
1	1/7	Introduction, Performance Metrics	
	1/9	Other Metrics - Power, Cost, Complexity, etc.	
2	1/14	Pipelining Review	
	1/16	Superscalar/OoO Review	
3	1/21	Superscalar Fetch	
	1/23	Advanced Branch Prediction	
4	1/28	Advanced Fetch	
	1/30	Instruction Decoding	
5	2/4	More Decoding	
	2/6	Midterm Exam #1	
6	2/11	Register Renaming	
	2/13	Instruction Schedulers	
7	2/18	More Instruction Scheduling	
	2/20	Even More Instruction Scheduling	
8	2/25	ALUs and Bypass	
	2/27	Load/Store Handling	Last day to drop with "W" grade is Feb 28.
9	3/4	More Load/Store Stuff	
	3/6	Caching and Memory	Project Proposals Due
10	3/11	More Caches and Memory	
	3/13	Midterm Exam #2	
11	3/18	Spring Break - No class	
	3/20		
12	3/25	Commit and Exception Handling	
	3/27	Memory and Prefetching	Project Status Report Due
13	4/1	Multithreading and Multicore	
	4/3	Advanced Cache Coherence	
14	4/8	Case Studies - Intel Pentium 4	
	4/10	Case Studies - Intel Haswell	
15	4/15	Case Studies - AMD Piledriver	
	4/17	Case Studies - IBM POWER 8	Project Final Report Due
16	4/22	Project Presentations	
	4/24	Project Presentations	
	5/1/2012 (Thu)	Final exam 11:30am - 2:20pm	