CmpSci 535
Computer Architecture
Course Syllabus
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Textbook: Computer Architecture A Quantitative Approach, 5th Ed.
John Hennessy and David Patterson, Morgan Kaufmann 2012

Course Goals: As computer scientists, we tend to program using algorithms and abstractions that are significantly removed from the hardware on which our code executes. Yet there are many problems in which erroneous assumptions about how the hardware works will lead to poor performance, errors, security vulnerabilities, and other modes of failure. Software cannot completely hide physics! A deeper understanding of the underlying mechanisms of computers also helps inform our work so that we are able to appreciate technological advances. In this course, we explore the underlying architectural principles on which modern computers are built.

Course Notes: Available at https://people.cs.umass.edu/~weems/homepage/Courses.html. Slides, blog entries, etc. will be posted under CmpSci 535.

Grading:

Midterm: 10%	Final: 10%	Exam Prep Homework: 10%
Project Phase 1: 15%	Project Phase 2: 14%	Final Project Report: 15%
Class and Team Participation: 10%		Reading Homework: 16%

Exams are **open book** and **open notes**. This is so you can look up formulas or data as needed -- I don't expect you to memorize this sort of information for exams. I do expect you to have read the book, attended class, and to know where to look up the information that you need. There won't be time in the exams to read material you're unfamiliar with. The purpose of the exams is for you to demonstrate that you have attained an operational level of understanding of the material. **Bring a calculator** to all exams unless I specifically tell you that it won't be needed.

Exam Prep Homework

Due Dates: They are each due as specified, usually one week after they are handed out.

Late Policy: Please do these on time so they can be checked in time to give you feedback before the exam. If you know that you have a specific conflict, make arrangements with me in advance for an alternate submission.

Collaboration: The purpose of the homework is to enable you to gauge your comprehension of material from class, and practice answering questions like those on the exams. It is thus important to do this work alone. If someone else in the class asks you for help, try to take the role of a teacher and help them find the solution on their own; don't just give them an answer. If I feel that people are submitting answers that are merely copies of each other, I will grade the one solution and divide the credit equally among the copies.

Grading: Each homework will be assigned some number of points, with the maximum number indicated. Midterm prep and final prep are each 5% of the grade.

Reading Homework

Form: For each reading assignment from February 7 through April 25, submit at least two questions pertaining to the reading. They can be aspects you would like clarified, or that you would like to know more about. In each class there will be time to have a few of these answered. The book is the canonical text in the field, and goes into more depth than the lecture can cover, so it is worth reading.

Due Dates: They are each due on the date we are scheduled to cover the material in class.

Late Policy: Please do these on time in preparation for class. No credit if handed in late.

Collaboration: The purpose of this homework is to encourage you to do the reading. That's impossible to do collaboratively. It should be fairly easy to jot down a couple of original questions as you go through it. But again, if I find that people are submitting copies of the same questions, I will divide the credit among the copies.

Grading: Each homework is 1% of the grade. There are 16 of them. You can get extra credit by working ahead, or asking more than two questions (up to five).

Semester Project: The project involves designing an architecture and a simulator for it that enables accurate measurement of execution time. In addition to the simulator you will write an assembler, and at least two benchmark programs. The project is best done as a two-person team, although it can also be done individually. The simulator will be built in a modular manner that loosely follows the actual hardware construction. It must have a user interface that shows what is happening in the machine, and to control program loading, execution, and debugging.

The project is divided into two phases. The first phase is the design and construction of the various pieces of the simulator. The second phase is demonstrating the complete system with cache, and then enhancing it with a pipeline, which will be evaluated using at least two benchmark programs.

There are in-class demonstration dates for the different simulator modules. You can either run the demo on a laptop, or remotely using a web browser. You will provide a final report on the design of the architecture and its simulator, together with the machine's performance improvements (cache, pipeline, both). At each demo, each team member is expected to report on the tasks assigned to him or her in terms of progress to date and goals to be achieved before the next demo. More info on the project is in a separate handout.

Teams: Your grade for the semester is partially dependent on your performance as a team. Some ways that you can help to ensure that your team does well:

Be realistic with your partner in discussing your abilities and time commitments when you divide up project work. Look at the long-term project workload – you can partition the work over the semester as well as on each module.

Be explicit in your expectations of each other. Write them down and give everyone a copy.

Make sure that you have each other's schedules, phone numbers, e-mail addresses, etc. Establish a clear policy of when it is OK to contact one another. Let each other know when you are going to be unavailable with enough advance warning for good contingency planning.

Communicate! Tell each other what you are thinking. Don't keep thoughts inside. Praise each other for jobs well done. If you feel the need to criticize, use statements that start with "I think…." or "I feel…" Avoid criticism with the accusatory "You did…," or "You always…"

Think of yourselves as a team. Develop some team spirit. Name your team or your architecture. Develop a unique style for your team homework and demos (e.g., team colors, a logo). Get to know each other as individuals. Do lunch. Discuss hobbies, career goals. If you each take the time to care about one another, then you'll do what it takes to excel as a team.

Accommodation Statement
The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty Statement
Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).