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 535/635.

Grading: Midterm: 15%  Final: 15%  Homework: 20%  Project Phase 1: 15%  Project Phase 2: 15%  Class and Team Participation: 20%

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.

Homework
Due Dates: They are each due at the start of class one week after they are handed out.
Late Policy: Please do your work on time so it can be checked in a timely manner. If you know that you have a specific time conflict, make arrangements with me in advance for late submission.
Collaboration: The purpose of the homework is to give each person a chance to gauge their comprehension of material from class, and to practice answering questions like those that will appear on the exams. It is thus important that you 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 an overall numerical grade -- some number of points, with the maximum number indicated. Each of the homework assignments makes up the same percentage of your final grade.
Semester Project: The project involves programming a simulator for a computer, and can be done individually or (preferably) as a two-person team. Your team will design an architecture, develop a simulator and assembler for it, and then run some benchmark programs on it. 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.

There will be in-class demonstration dates for the different simulator modules. You can either bring your demo on a laptop, or write it in a manner that can be run from a standard web browser (e.g., as a Java Applet). 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 meeting. 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! Communicate! Communicate! Tell each other what you are thinking. Don’t keep thoughts inside. Remember to 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 that starts with an 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/).