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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: [https://people.cs.umass.edu/~weems/homepage/courses/index.html](https://people.cs.umass.edu/~weems/homepage/courses/index.html)  
Slides, blog entries, etc. will be posted under CmpSci 535.

Grading:  
Midterm: 10%  
Final: 10%  
Exam Prep Homework: 4%
Project Phase 1: 15%  
Project Phase 2: 14%  
Final Project Report: 14%
Team effort: 5%  
Class work: 10%  
Reading Homework: 18%

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: Midterm prep and final prep are each 2% of the grade.
Reading Homework

Form: For each reading assignment from February 3 through April 29 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 unless arranged in advance.

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 18 of them. You can get extra credit by working ahead, asking more than two questions (up to five), or submitting questions for readings outside of the specified date range.

Class Participation Work

Form: To help in starting the project and in solidifying concepts presented in class, there will sometimes be exercises done in class. These will be handed in at the end of the class in which they are done. Because they represent participation in team or group discussions, they cannot be done outside of class, unless prearranged due to an unavoidable absence.

Grading: The class participation work will total 10% of the grade. The number of exercises will depend on how the class is proceeding. If we fall behind, some may be skipped.

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 work is divided into two phases. See the separate handout for the details of the project.

Team effort: The project is best done as a two-person team. Three person teams can be more difficult to manage and thus present a greater risk of failure. They will be considered only when a team has identified a set of ambitious goals that need the extra labor, and a clearly defined project management strategy that mitigates against disaster. 5% of the grade is allocated for evaluation of the effectiveness of the team in working together. It is very challenging to do this project alone. For individual projects, this fraction becomes additional emphasis on use of good software engineering methodology and tools, and staying on schedule. At each demo, each team member is expected to report on their assigned tasks in terms of progress to date and goals to be achieved before the next demo.

Phase one consists of the ISA design proposal and presentation, a demo of the memory subsystem, and a demo of the functional simulation with a minimal subset of instruction types and basic user interface. Each of these components is 5% of the grade.

Phase two consists of a demo of the simulator with all of the instructions operational, a complete user interface, and a working assembler, and a final demo showing the two benchmarks running in all four modes of operation. Each of these demos is 7% of the grade.

Report: You will submit a final report on the project that is worth 14% of the grade.
**Teamwork tips:** 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/).