CSCI 281: Assembly Language & Computer Architecture

Professor
Adam A. Smith
asmith@pugetsound.edu
http://cs.pugetsound.edu/~aasmith/
Thompson 390e
Office MF 12-1, or appointment

Meetings
We will meet MWF 11:00-11:50 in Thompson 399. The final will be on December 15th at 12:00.

Course Description
This class is about creating a real, physical machine that runs code. Whenever you write a program, it needs to be translated by the computer into a form that it can run. This “machine code” looks like a stream of raw data, and is not easily readable by people. However, assembly language is an intermediate between high-level languages like C and Java, and the raw machine language. It can be read by humans, but its flow is much more oriented toward the computer’s point of view. Assembly language is specific to the kind of processor a computer uses (e.g., x86, ARM, or MIPS).

Even machine code eventually needs to be translated, down to the physical streams of electrons that make a computer compute. We will learn how chips work, and experiment with some basic circuit designs.

Topics Covered ("Learning Outcomes")
By the end of this class, you will be able to understand and use:
- Basics of the C programming language.
- Digital logic.
- Hardware design.
- MIPS assembly language.
- Memory addressing.
- Pipelining of instructions.
- Caching and virtual memory.
- Pros and cons of different architectures (especially RISC vs. CISC).

Web Page
The class web page is located at http://cs.pugetsound.edu/~aasmith/cs281/. Valuable info and links will be posted there, including the complete homework schedule.

Text
We will be using “Computer Organization and Design”, by Patterson and Hennessy. You may use either the 4th, 5th, or 6th edition. Please be careful if you buy this online, as there is an unrelated book by the same authors reversed (Hennessy and Patterson). All editions of the book we are using have an abacus on the front cover.

Prerequisites
You should have already passed CSCI 261 or its equivalent, with a C- or higher. I will also assume basic scientific literacy (e.g., high school chemistry and physics).

Course Policies
There will be twelve assignments over the course of the class—usually one each week. You are free to talk to others in the class about them, but I expect what you finally turn in to be 100% your own work.

Assignments will be penalized by 20% for each working day (or fraction thereof) they are late, down to 40%. However, you will have five “extension days” during the semester to extend a deadline by one working day. These are intended for unforeseen circumstances, and will be used automatically unless you specify otherwise. The hard deadline for all assignments is the beginning of the last class before the relevant exam. (This is so that I may release the answer keys.) After that, I will not take any more assignments, regardless of extension days.
There will also be a course project toward the end of the semester. This is a self-directed project, expanding on one of the areas we have covered. You may work in pairs, if you wish. One-paragraph proposals will be due in November, and the project itself will be due on the last day of class.

You all should be aware of the Honor Code at the college. Please do not cheat—it will not go well for you. Any suspected cheating will be immediately reported.

Exams are closed book, and will be cumulative. You are allowed a calculator (or your phone, so long as it is in "airplane mode") and one two-sided, letter-sized page of notes. They will be graded on a curve, with the highest score considered to be 100%.

**Grading**

Final grades will be determined as follows:

<table>
<thead>
<tr>
<th></th>
<th>Homeworks</th>
<th>Project</th>
<th>Midterm 1</th>
<th>Midterm 2</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>25%</td>
<td>10%</td>
<td>20%</td>
<td>20%</td>
<td>25%</td>
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In particular, notice how heavily weighted assignments are. **Missing assignments is the easiest way to get a lower grade.** Please be sure you do them, and on time. In addition, class participation and effort may help bump you up, if your final grade is borderline.

**Attendance**

I will not be keeping attendance (except on the first day). However, odds are that your attendance will correlate highly with your final grade.

**Miscellany**

Consider getting a flu shot. **This is especially true this year. You don’t want to worry that you might have been infected with covid.**

Please remember to be kind to one another. With covid, we are in an entirely unprecedented situation. Also please remember that you are all here to learn. None of you are masters of this material yet, and there’s no need to make things difficult for others.

**Required Boilerplate**

Please review university emergency preparedness, response procedures and a training video posted at [www.pugetsound.edu/emergency/](http://www.pugetsound.edu/emergency/). There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.

If you have a physical, psychological, medical or learning disability that may impact your coursework, please contact Peggy Perno, Director of Student Accessibility and Accommodation, 105 Howarth, 253.879.3399. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

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Finally...if there’s anything else I can do to help you, please let me know. I’m willing to go out of my way to make this a valuable class for you, but I can’t do that unless you talk to me.