

CSCI 498C: Elements of Computing Systems

Winter/Spring 2010, M/W/F 2-3PM, Green Center 249

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Office hours are M/W/F from 4 – 5PM, or by appointment.

Course Web home: <http://mines.humanoriented.com/classes/2010/spring/csci498/>

Prerequisites: CSCI261 or approval of instructor, and a passion for programming.

Texts: Code. Petzold. Microsoft Press. 2000.

The Elements of Computing Systems. Nisam, Schocken. MIT Press. 2005.

Both of these texts are available at the campus bookstore.

Course Objectives

The goal of this course is to understand the entire abstraction stack of a modern computer system by building a computer from the ground up, from NAND to Tetris. Topics include:

- Boolean and sequential logic
- Machine language and architecture, assemblers
- Virtual machines
- High-level languages, compilers, operating systems
- History, the future

At the end of this course you should have a complete functioning computer and a thorough understanding of all the components therein.

Grading

- Attendance & Participation 10%
- Projects 60%
- Reading assignments / quizzes 20%
- Final Paper 10%

Attendance & Participation

You are expected to be present for class (of course!). This is a fun but challenging class that demands your consistent participation. In the end, you will be a CS ninja ready to take on any binary machine (and the creatures it unleashes upon you). You may be excused from class with a 24-hour advance notice via email.

More than two unexcused absences will be met with my evil wrath.

Project

Most of your labor in this class will involve continuous work on a semester-long project. You will build an entire computer (hardware & software) from the ground up using a hardware emulator and development environment. At the end of the semester you will have a completely functional computer that *you* will have built and can extend (to play games, take over the world, etc).

Homework (Reading)

You will receive short homework assignments that will almost always be reading assignments from Code. You will be given take-home quizzes on the reading material and these will be due at the beginning of each class.

Exams

There are no exams in this class. Yay!

Final Paper

You will be required to complete a final paper that demonstrates your understanding of *and your ability to clearly explain* the topics covered during our journey of building a modern computer.

Accommodation

If you need certain accommodation based on disability, talk to the instructor in person so that appropriate arrangements can be made. **If you will be absent from class, you will be excused if you send me an email or tell me in person ahead of your absence.**

Course Schedule

This schedule is not fixed in stone and is subject to change according to the actual progress of the course.

| <u>Week</u> | <u>Lecture</u> | <u>Reading</u> |
|-------------|----------------------------------|------------------------|
| 1 | Introduction, Setup | CODE 0-4 |
| 2 | Binary Systems, Boolean Logic | CODE 5-10, ECS 0-Intro |
| 3 | Boolean Logic & Logic Gates | CODE 11, ECS 1 |
| 4 | Boolean Math & Adders | CODE 12-13, ECS 2 |
| 5 | Sequential Logic & Flip Flops | CODE 14-16, ECS 3 |
| 6 | Machine Language | ECS 4 |
| 7 | Computer Architecture & CPUs | ECS 5 |
| 8 | Assembler | ECS 6 |
| 9 | Virtual Machine Stack Arithmetic | ECS 7 |
| 10 | Spring Break | |
| 11 | Virtual Machine Program Control | ECS 8 |
| 12 | High-Level Language | ECS 9 |
| 13 | Compiler I: Syntax Analysis | ECS 10 |
| 14 | Compiler II: Code Generation | ECS 11 |
| 15 | Operating System | ECS 12 |
| 16 | Wrap Up / Recovery | ECS 13 |
| 17 | Dead Week | |

On Collaboration & Academic Integrity

Students are encouraged to discuss and collaborate as much as possible! However, it is obviously not acceptable to copy another student's solution. Your work must be your own. In addition, simply copying solutions found online is not acceptable. Be aware that homework assignments, project and quizzes will not just focus on producing correct code, but explaining how things work.

Please see the Student Handbook for details on academic dishonesty. No exceptions will be made for students found simply giving away or taking another's solutions.

Academic Integrity Pledge

Your enrollment in this class means that you pledge to uphold the high standards of academic ethics and integrity expressed by the Colorado School of Mines Student Honor Code by which you are bound. In particular, you will not misrepresent the work of others as my own, nor will you give or receive unauthorized assistance in the performance of academic coursework. You should understand that my instructor will report any infraction of academic integrity to the Department Head and that any such matter will be investigated and prosecuted fully.