

Instructor

Prof Eric Corwin
374 Willamette Hall
ecorwin@uoregon.edu

Lectures

TTh 2:00 – 3:50 pm, 110 Willamette Hall

Attendance is not required, but is strongly recommended. Note that there is a “clicker-based” participation grade as well as in-class quizzes – see the Grading and Quizzes sections, below.

Assistants

This course has several people assisting it – make use of them!

Andrew Hammond – SLP GTF ahammon7@uoregon.edu

Blake Parris – GTF parris@uoregon.edu

Kris Schober – GTF kschober@uoregon.edu

Office Hours

Eric Corwin: Friday 1pm-2pm, Wil 374

Andrew Hammond: Friday 11am-12pm, Wil 373

Blake Parris: Monday 4pm-5pm, Wil 40

Blake Parris Drop-in: Wednesday 4pm, Science Library, Physics Drop-in room

Kris Schober: Monday 11am-12pm, Wil 77

Kris Schober Drop-in: Thursday 12pm-1pm, Science Library, Physics Drop-in room

These times may change during the term. There are **lots** of office and drop-in hours! You're **strongly** encouraged to come to these, mine as well as the course assistants', either with specific course-related questions, or just to chat about physics, science, and other general topics. (Note that there is no discussion section for the course.)

Course Demands

I intend this class to be serious, challenging, and demanding. I do not expect or require you to have a strong mathematical background, but I do expect you to be able to engage in abstract analytical thought. You will notice that the textbook is quite sophisticated. I expect a similar level of sophistication from you.

Course Description

“Any sufficiently advanced technology is indistinguishable from magic.” – Arthur C. Clarke

Is the internet magic? No. But it is an advanced technology. To demystify its workings we will peel back its layers, one by one, to reveal the physical principles underpinning the internet: The internet is nothing but a network of computers, computers are nothing but a collection of instructions and a processor, a processor is nothing but a grid of logic gates, logic gates are nothing but a group of transistors, transistors are nothing but linked semiconductors, semiconductors are nothing but crystalline materials with defects, and so on.

My goal for this class is to learn a fundamental understanding of the functioning of a computer from bottom to top and top to bottom. At the end of this class you should be able to understand how a computer works and what a computer can and cannot do, and why. To achieve this, we will follow the organization plan laid out in the text:

1. Introduction to Computers
2. Computer Organization (How to build complex systems from simple logic gates)
3. The Theory of Computation
4. Coding and Information Theory
5. Reversible Computation and the Thermodynamics of Computing

Other goals: Through readings and discussions, we will also use our knowledge of the physics underlying the internet to gain insight into important economic, social, and technological issues in internet technology.

Textbook

Feynman Lectures on Computation by Richard Feynman

Materials

We'll use "clickers," personal response system that allow real-time polling and assessment in class.

Each enrolled student needs one clicker. Clickers can be purchased at the bookstore, new or used.

If you know someone not enrolled in this course, borrowing their clicker for this class will work fine. You will need to register your clicker following instructions on Blackboard in the Course Documents section for this course.

Some assignments will involve working with data. You should be reasonably adept at navigating the internet and making simple graphs (e.g. with Excel, Google docs, etc).

Homework

Weekly homework sets will be assigned on Canvas about one week before they are due. Homework is due each **Tuesday by 2:00 pm (before class)**; put into the designated In-Box (location: basement of Willamette – directly below our classroom, bottom of stairs and to the right). We will accept late homework no more than 24 hours late (5:00 pm Friday in the homework In-Box), but the score will be reduced by 50%. You are encouraged to discuss homework assignments and readings with others, though your "final answers" should be

your own. Office hours are an excellent place to discuss homework! Solutions to all the problem sets will be posted – study these.

Reading Quizzes

Most of classes will begin with a very short reading quiz, using your clicker. The quizzes should add incentive to do the assigned reading before class, and the questions are designed to be easy if you've done the reading (they won't test mastery of the material). Your responses are known only to you and the Instructors. Bring pencil, paper, and calculator to every class for these.

Grading

In general, vibrant class participation enhances all students' learning experiences – one of the motivations for “clicker” usage. However, I consider it overly paternalistic to require attendance. Therefore there will be two possible weightings of the various grade components:

- *Reading quizzes (RQ)*: Short, simple clicker questions occasionally at beginning of class
- *Participation (P)*: In-class i>Clicker-based polls related to the present topic, scored by participation only, not the accuracy of the response.
- *Homework Assignments (HW)*
- *Midterm Exam 1 (MT1)*
- *Midterm Exam 2 (MT2)*
- *Final Exam (F)*

Grading option 1: RQ/P/HW/MT1/MT2/F = 5/10/30/15/15/25 %

Grading option 2: RQ/P/HW/MT1/MT2/F = 0/0/30/20/20/30 %

I'll grade each student using both options, keeping the higher overall score.

Final Grade: A=88-100%; B=76-87.9%; C=64-75.9%; D=52-63.9%; F<52%.

If necessary, I may apply a curve to achieve a higher average final grade. However, you are guaranteed at least the grade listed here based on your course average. Pass/fail grading option: A passing grade requires at least the equivalent of a C- grade.

Math Diagnostic

The mathematics in this course will be very elementary, as discussed in class, but it is important to be comfortable with these basic numerical skills. Therefore there will be a diagnostic “quiz” to be taken on-line (via Canvas) on basic mathematics. Re-taking the quiz is allowed – you are encouraged to learn from your mistakes, and to see the TAs and me for help. Scoring 75% or higher by the Friday of Week 2 is required for continuing in the course. (A score of <75% will automatically result in a failing grade for the course.)

Absences

I realize that it is unavoidable that people will have to miss a few classes (due to illness, for example). Therefore I will rescale the grades of the clicker questions, and reading quizzes such that 90% becomes 100%. (In other words, I will divide each student's percentage by

0.9, with a ceiling of 100%. If your original score were 75%, the rescaled score would be 83%.) I will not allow “makeup” quizzes, etc. – the point of this policy is to avoid the messes created by these sorts of ad-hoc arrangements.

Laptop/tablet/phone policy.

Students are encouraged to bring in laptops, tablets, or smartphones with which to engage in activities in class. However, **the use of laptops and phones in class is not allowed during lecture.** Why? Several studies, plus past experience, show that students using laptops in class spend a great deal of time on non-class-related activities (facebook, games, ...) and that these distractions negatively impact both learning and grades. This alone isn't a reason to ban laptops – you're responsible for your own performance in class. In addition, however, studies have shown that non-class-related laptop use distracts and impacts the learning of other students nearby. (E.g. Fried, C. B. *Computers & Education* 50, 906-914 (2008).) Plus, students have complained to me about the environment created by their classmates laptop use. Taking notes by hand, by the way, is more effective in cementing concepts in your mind. In summary, laptops are not allowed in class. The only exceptions will be for people with documented medical needs; please see me if this is the case.

Academic Honesty

Students are expected to abide by university policies on academic honesty, avoiding plagiarism, fabrication, cheating, and academic misconduct. The Student Conduct Code (conduct.uoregon.edu) provides definitions of these terms and explanations of the university policy on the subject. The UO Library also provides a guide to avoiding plagiarism (libweb.uoregon.edu/guides/plagiarism/students/). You are responsible for understanding these regulations and abiding by them. Students should be particularly careful to avoid plagiarism in out-of-class assignments, as well as projects and exams. Academic dishonesty will be dealt with severely, as it is disrespectful to your fellow students and your instructor, as well as being against both university regulations and state laws.

Physics Drop-In Help Center

Free help with any standard math or physics question can be obtained in 147 Willamette Hall. The Drop-In Help Center is staffed 5 days a week and most of the day (hours are posted on the door). Note: some of the computer-related topics in this course may be outside the expertise of the tutors there, but they can probably still help you.

Policy on Missed Deadlines, Significant Absences and Incompletes

Only the following unforeseen and uncontrollable emergency situations are acceptable excuses for missed deadlines:

- Documented serious illness/injury;
- Documented death in the immediate family.

All of the following are unacceptable – note that they include “personal” as well as “technological” excuses:

- Special occasions (e.g. weddings, birthdays, anniversaries etc.)
- Work and school conflicts: “I had to work extra hours,” “I have a huge midterm tomorrow in another class...”
- Couldn’t get to campus (alarm didn’t ring; missed the bus; etc.)
- Being generally “busy” or having “a lot going on right now...”
- Forgot or “mixed up” the assignment or due date
- No access to computer or printer; assignment completed on computer is “missing,” was accidentally erased, or is inaccessible

If an extraordinary situation arises which will compromise your ability to meet a deadline please come talk to me **well in advance** of the deadline and we can work something out.

Succeeding in this Course

Plan ahead and start early! The reading assignments are a vital part of this course, and it is important to start reading them early not only to understand the subject matter but to be able to articulate what you don’t understand – in class lectures and discussions will build on your reading experiences. Note that the reading assignments must be done before the days at which their topics are discussed in lecture. In general, it will be crucial to keep up with the course and not fall behind; later topics will build on earlier ones.

Make use of resources. If you have questions about lectures, assignments, readings, or other matters, please visit office hours, or communicate by email. Individual appointments can readily be arranged to accommodate schedule conflicts with the regular office hours. The University’s Academic Learning Services (ALS) center provides a variety of workshops, individual consultations, writing assistance labs, and more to assist UO students. For more information see als.uoregon.edu, or call (541) 346 3226. The University’s Teaching and Learning Center also provides workshops and courses – see tlc.uoregon.edu and tlc.uoregon.edu/learningservices/workshops.html.

Students with disabilities

If there are aspects of the instruction or course design that result in barriers to your inclusion, please notify Prof. Corwin as soon as possible. You are also welcome to contact Disability Services in 164 Oregon Hall, 346-1155.