Syllabus for CSCI 231 Intro CS Concepts
Spring 2015

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Home: *omitted online*
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Office hours: MW 1:00–3:00 p.m.
F 2:00–3:00 p.m.
and by appointment (esp. Tuesday mornings)
You are welcome to stop in when my office door is open.

Class meetings

TTh 1:15–3:05 p.m., Science 131
Final exam: 1:30–3:30 p.m. on Wednesday, May 6

On-line resources

Additional (and updated) course information will be available at the class page at

> http://cs.wheaton.edu/~cgray/csci231/

Texts

There are two options for the textbook; if possible, get

> Harel, *Algorithmics: The Spirit of Computing/3e*, Addison-Wesley, 2004 (or Springer, 2012 or 2014).

If you can't get your hands on that, you can get by with

> Harel, *Computers, Ltd.: What They Really Can't Do*, Oxford, 2000.

There will also be course notes handed out as the semester progresses.

Description

CSCI 231 Introduction to Computer Science Concepts. A survey of the fundamental ideas and methods in the science underlying computation. Classroom activities and hands-on laboratory investigations emphasis working with both data and process at different levels of abstraction, from logic and circuits to algorithms and formal machines. History of computing and its relation to other disciplines. Societal and ethical issues raised by computing technologies. (2 hours lecture with 2 hours lab) (2, lin)

During this semester, we will cover material bottom-up: the first segment of the course will progress from the lowest levels (bits, circuits) up to the organization of a typical computer. The balance of the course will survey some of the key ideas in the science of computation as well as some interesting areas in which computing is used, ending with ways computation affects society and the way we view the world. This course is neither deep nor comprehensive; you can think of it as introducing you to a few landmarks within the territory of computing and giving you a little bit of the flavor of the culture of computer science.

There is no formal prerequisite for this course, but it will require a bit of math at the level of high-school algebra or pre-calculus (polynomials, exponents, logarithms). In addition, we will use *lots* of the math you (should have) learned in elementary school.

Format

This is a linear quad course, for 2 hours credit, even though it is scheduled like a typical 4-hour course. Much of the class time will be spent in labs and other activities that replace most of the written homework you would expect in a typical course. This course substitutes in-class time for much of the out-of-class work. A few "labs" will be in-class activity instead of in-lab work.

Goals and objectives

The first goal of this course is for you to grasp of what computer science is, including a sense of what computation can and cannot accomplish. In addition, you should gain some insight into the ways that computing technology—and technologies more broadly—affect and are affected by social concerns.

To put that more concretely, by the end of the course you should:

- become proficient in some basic techniques of computing;
- be able to describe how computation is realized in a physical system;
- relate different perspectives on computing (science, engineering, applications, markets);
- relate computing and computer science to mathematics and other sciences, including values implied;
- place the development of computing in its historical context, including philosophical/intellectual currents;
- differentiate what computation can and can not do, even given the rapid pace of technological advance;
- describe some of the moral and social implications of computing technologies, including how such concerns have shaped what we now experience;
- articulate the difference between technical *can* and *should*; and
- think critically and write about the intersection between technical and humane concerns, including interaction with Christian doctrine.

Grading

You will do three kinds of graded work in this class:

- *labs* will give you a chance to demonstrate your grasp of fundamental techniques and ideas (25% of your grade);
- *writing assignments* (along with an in-class presentation and participation in some class discussion) will be mainly concerned with the interaction between technical and social/humane concerns (15% of your grade); and
- *exams* will measure your grasp of techniques, information (60% of your grade).

In addition, my assessment of your participation in class (including attendance) may raise or lower your grade by up to one full letter.

There will be three midterm quizzes/examinations in addition to the final. A quiz will be given in the first hour on Jan 29; examinations are currently scheduled for Feb 26 and Apr 16. All tests will be cumulative. Please note that the in-class discussion scheduled for Apr 28 (including any written work) is considered part of the final exam.

The other written assignments will include one short paper (less than 10 pages), a few short essays (1–2 pages), and an in-class presentation.

Please note the final examination time; as the catalog states, "Final examinations must be taken as scheduled." The only exception permitted is if you have three exams scheduled that day, and even that is not automatic.

Class policies

Academic integrity As Christians, I'm assuming that we all intend to be honest. To help you with that, you need to be aware of the representations that you make when you turn in course work. The primary claim you make when you turn anything in is that it is *your* work, except as you explicitly acknowledge (by citation, for example). What you're asked to do in the lab doesn't require outside sources; so this consideration applies mainly to the other written work (essays and presentation) later in the semester.

You will be doing most lab work with other students. Keep in mind that when you turn in lab work, you are asserting that you could reproduce it on your own. Be generous in acknowledging assistance within your work.

In your papers and essays, you are also asserting that what you turn in was produced for the assignment. Recycling a paper (or significant portions of one) that you've written for some other class is plagiarism, too. Cite your own papers; acknowledge research work by others, whether published or not.

Written assignments Much of your homework will be the lab assignments. In the lab, you will usually be working together, but you will turn in the assignments individually. You will usually receive the lab handout in advance, in which case you are expected to have read it before you come to class. You should usually be able to complete the assignment during the lab period, though you will probably need additional time to write it up. Unless otherwise stated, each lab's write-up is due at the beginning of the next class meeting; we will take time to address questions at the beginning of that period.

Lab write-ups may be either typed or hand-written, but must be neat and legible. Please use only one side of the paper, and staple (do not fold) multiple pages together.

While content (including organization) is primary in your other written work, form matters. Standard English usage, spelling, and grammar will be treated strictly, though individual assignments may indicate that some informality is allowed (such as use of first-person pronouns). When citation is required, use MLA or Chicago form in the scientific style. Consult me (in advance) if you have difficulty citing an unusual source.

Except for labs and in-class writing, assignments should be typed, double-spaced with a reasonable type size and layout, on one side of the paper. Ensure that pages are numbered and stapled together; it is a good idea to include identifying information in a compact page header.

Attendance, participation, and classroom behavior This is a lab and participation course; so it is very important that you be present. If you must miss because of illness, family emergency, or school activity, you need to let me know as soon as possible. My office phone takes messages at all hours, and e-mail is welcome. I will work with you, but my willingness is contingent on your responsible behavior.

Except for emergencies, you should arrange for missed examinations in advance. Assignments are due at the beginning of class on the indicated dates; that means you need to turn them in early if you will miss class, and that arriving late for class can make your assignment late. While I will usually encourage you to complete and turn in late work (for the sake of learning), I do not promise to give credit for it.

We will start promptly; so be considerate of the rest of us in class by making sure you arrive on time. Late entries are disruptive, and habitual tardiness will be treated like frequent absence when it comes time to figure your grade.

Special circumstances and needs Wheaton College is committed to providing reasonable accommodations for students with disabilities. Any student with a documented disability needing academic adjustments is requested to contact the Academic and Disability Services Office as early in the semester as possible. Call 630.752.5941 or email jennifer.nicodem@wheaton.edu for further information.

Gender-neutral language For academic discourse, spoken and written, the faculty expects students to use gender inclusive language for human beings.

Schedule

Here is an initial class schedule; additions and changes will show up online.

Reading selections from the textbooks are marked *A* for *Algorithmics* or *CL* for *Computers, Ltd.*; course notes are marked *N*.

Date	Reading	
Jan 13	CL preamble, CL1 / A1	Introduction; historical background
15	CN1, CN2	Algorithms; representing data, numerals
22		Binary numerals *Lab 0 Data*
24		Numerals *Lab 0 Data*
27	CN3a	Logic and circuits
29	CN3b	**Quiz** *Lab 1 Circuits*
Feb 3	*Faculty development workshop*	
5		Modules; circuit technologies *Lab 2 Modules, ALU*
10		Time and feedback in circuits *Lab 3 Sequential circuits, memories*
12	CN4	
17	CN5	Computer organization, hardware and software
19		Programming languages, programs
24	CN6	Intellectual property; review
26		**Exam**
Mar 3	CL3 / A6	algorithms and complexity
5		complexity
9-13	*Spring break*	
17	A9	automata and Turing machines
19		*Lab 4 machines*
24		universality
26		correctness
31	CL2 / A8	computability
Apr 2	CL4 / A7	intractability
7	CL6 / A12 CN7	cryptology
9		*Lab 5 cryptology*
14		social issues
16		**Exam**
21		CL7 / A15
23	Turing	Turing's paper
28		AI "essay"
30		review; final thoughts
1:30-3:30 Wed 6 May		**Final exam**