

Syllabus

CMSC 160: Intro to algorithmic design I

Fall 2024

Lecture: MWF 1pm, Rotunda 352
Lab: Tue 9:30am, Rotunda G56
Websites: <https://www.cs.longwood.edu/courses/cmsc160>
<https://longwood.instructure.com/courses/1313935>

An introduction to problem solving and algorithmic design using an object-oriented programming language. Topics include programming logic, iteration, functions, recursion, arrays, memory management, user-defined data types, abstraction, and complexity analysis. 4 credits. Corequisite: CMSC 161.

Professor: Don Blaheta
Office: Rotunda 334
Phone: x2191
Email: blahetadp@longwood.edu
100% Office hours: Mondays 3–4pm; Tuesdays 11am–noon;
Wednesdays 10:30–11:30am; Fridays 2–3pm

Overview

Edsger Dijkstra¹ famously said that “computer science is no more about computers than astronomy is about telescopes.” What did he mean?

In this course, we will indeed spend plenty of time with computers, but my focus is ultimately to teach a different way of thinking about problems. The key skills you will develop are analytical problem solving and thinking in terms of abstractions. Should you choose to continue in computer science, you will use these skills in every CS course you take, whether you are writing programs in C++, or in some other language, or not at all. And if I really do my job, the precision of thought you learn here will help to shape how you think about problems in your other courses, even if you never take another CS course again.

Course learning outcomes

At the end of this course, the successful student will be able to:

¹A pioneer of computer science. More info available on Wikipedia.

1. implement algorithms using C++;
2. read, write, and debug programs that use standard control constructs such as if/else, loops, and functions;
3. appropriately choose among the fundamental programming data types; and
4. use standard design strategies for ensuring that programs are robust and readable.

Textbook and resources

The “textbook” is a course pack that I have written. It is free, and online.

You will be given an account on the department’s computer systems, where we’ll use the Linux operating system and a compile system built on the gcc compiler. You may also be interested in installing Linux on your own machine; if so, contact me and I’ll help you get it set up. Some of the assignments, especially early in the semester, will use the classroom software at codeboard.io, so you will get an account there too (which we’ll walk through how to sign up for it).

You must have a device capable of running ssh software that you can bring to class—this probably means a laptop, although some kinds of netbooks might work. You’ll need to bring the device with you (charged enough for 75 minutes and/or bringing a power cord) for the lab days.

I’ll ask you to join the Slack channel for this course. Slack is a communication system similar to IRC or Discord, widely used in the professional tech community to manage team communications, and seems like a better way to ask and answer questions than a Canvas discussion board. You’ll get an invite in your Longwood email, but if you prefer to connect from another email address that’s fine too (just tell me so I can send the invite).

In the hopefully unlikely event that you need to go into quarantine or isolation (for Covid-19 or for some other reason), but are otherwise well enough to continue working, I’ll expect that you have a device (your computer, or a phone or tablet) that is capable of connecting to a live meeting via Zoom, and reasonable bandwidth to accommodate that.

AI Policy

My general feeling about AI is this: AI is a tool. Use it when it’s helpful, don’t use it when you could do it better or faster yourself.

That said, there are certain skills that programmers and computer scientists will need to develop and execute without the help of AI, slightly because AI might not *always* be available but mostly because you’ll need to be able to evaluate and debug the code

that the AI (or other programmers) have given you. Thus for assignments that are about *developing* your programming skills (labs, homeworks, projects), I'm going to discourage use of AI until you've given a few solid attempts without. For assignments that are *assessing* your skills (exams) I'll have specific instructions on whether you are or are not allowed to use generative AI to assist. *In general* tasks that you're doing on your own time will permit use of AI, but please attend to specific instructions on each assignment.

I will expect that when you *do* use generative AI, you will document it: say which AI system you used and what help it gave you. Some assignments will have more detailed instructions on what and how to document this.

(Note that although Longwood's Honor Code does not inherently ban the use of AI, some other professors seem to think it does, so for your safety you should check with each professor before using it in their class.)

The section formerly known as "Covid-19 notes"

I have a few policies that originally evolved in response to the pandemic but I've decided they're just good policy so I kept them. Here's the gist: It's really easy to keep zoom open for every class, and it's not nearly as good as in-person attendance but way better than total absence. So I open Zoom every day and ask you to make good choices.

Attending class. There are two ways you can attend class: in person, or via Zoom link. Either mode of attendance is sufficient to mark you as "attending" (not necessarily engaging or participating). If you attend via Zoom link,

- you must have a reason, and
- you must say what it is,

but I don't need any medical detail and if it's not directly covid-related I'm not going to police that. (Again: be an adult and make good choices.) The Zoom experience is nowhere near equivalent to the in-person experience and is not a replacement for it; but if you are quarantined, or otherwise just can't attend in person on a particular day, zooming is better than total absence.

Zooming vs masking. Although we've moved from "pandemic" to "endemic" on Covid-19, I'd just like to remind everyone that masking is still a tool in our toolkit: if you're feeling a bit sniffly, you can still wear a mask. We all have masks, we all got really good at wearing them, and it's a courtesy to your classmates to take this easy step to decrease the likelihood of spreading anything. (Including colds and other stuff! Masks help us not spread *lots* of things.)

What if the professor gets sick? Same as for students: if I'm feeling a little sniffly, I'll wear a mask, and if I am more seriously sick (but well enough to teach), I'll zoom

myself into the class. If necessary I can teach from a zoom window on the projector screen (and have done so!); I'll post to the Slack and send an email with instructions as soon as I know I need to do this.

Content

Graded work

I figure that I have on average about 12 hours of your time every week, including class and lab time as well as reading, practice, homework, and lab work. If you find you're regularly spending substantially more time than this, please do come discuss it with me, so that we can ensure you're making the most effective use of your time. The work you do for this course will be evaluated as follows:

Engagement. You need to be actively engaged in this class. Engagement comes in many forms, but I expect that you will be interacting with your classmates, and with me, both in class (in-person or Zoom) and in the Slack channel. General engagement will be evaluated in two-week blocks—so you don't need to artificially say a thing every day—and it's ok if you lean more towards in-class participation or more towards Slack conversations but aim for at least a little of both. In addition, there may be occasional required specific interactions via Canvas or Slack that will be considered part of the engagement grade, and when I (occasionally) do reading quizzes they'll be part of this too. Engagement makes up 10% of the course grade.

Lab work. The central goal of the course is that you learn to program, so the bulk of the work you do will be programming work before, during, and after our assigned lab periods. Except where otherwise noted, work associated with a particular lab is due at 4pm on the following Monday. Lab work will make up 40% of the grade.

Exams. There will be two exams, one in October and one during the finals period. Each will have a take-home component and a sit-down portion. The final will not be explicitly cumulative, though of course the material from the second half of the course builds on the earlier stuff. **You are not permitted to discuss the exams *at all*, with anyone other than me.** Each exam is worth 25% of the grade.

The sit-down portion of the final exam will be 3–5:30pm on Wednesday, 11 December. If you will need to adjust that date you need to talk to me *well in advance* to arrange it.

What's the deal with CMSC 161?

In order to register for this course, you needed to also enroll in CMSC 161, *Software development tools and processes*. (If you somehow got in without doing so, please see me ASAP!) In that course you will learn how to access our department server, work with the command-line environment, and a variety of other basic dev skills; beginning in the second or third week and increasingly over the course of the semester, you will need to make use of those skills in this course as well.

Grading scale

I tend to grade hard on individual assignments, but compensate for this in the final grades. The grading scale will be approximately as follows:

A-	[85, 90)	A	[90, 95)	A+	[95, 100]
B-	[70, 75)	B	[75, 80)	B+	[80, 85)
C-	[55, 60)	C	[60, 65)	C+	[65, 70)
D-	[40, 45)	D	[45, 50)	D+	[50, 55)

While there will be no “curve” in the statistical sense, I may slightly adjust the scale at the end of the term if it turns out some of the assignments were too difficult. Final grades of A+ are recorded as an A in the grading system. Final grades below the minimum for D- are recorded as an F.

Note that *individual* grades recorded in Canvas should be accurate (and you should let me know if there's a data entry error!), but *averages* as computed by Canvas sometimes are not, if the averaging is complex or (especially) if an individual student has a special case scenario. The reference gradebook is my own spreadsheet, and while I will try to make Canvas reflect it (including averages) as well as I can, Canvas can't always handle it.

Calendar (tentative)

Wk	M	T	W	F
August				
1	26 Ch 1 How to read a textbook Variables Input	27 §§2.1–2.2 Account setup Hello, world!	28 §§2.4 & Sidebar Types Errors	30 §§3.1–3.2 Comparisons if/else
September				
2	[Labor Day no class]	3 * §2.3, Lab 1 Mad Libs	4 §§3.3 if alone Flowcharts Comparison errors	6 §§3.3 else if
3	9 §3.4 & Sidebar Blocks Nested if Flowcharts cont'd	10 Lab 2 Test cases Conditional execution	11 §4.1 Named values bring laptops	13 §§4.2–4.4 Arithmetic expressions Order of operations Math functions
4	16 — Algorithm design Do it by hand	17 Lab 3 Tinkerblocks	18 §§5.1–5.2 Vectors and loops	20 §§6.1–6.3 Characters, <code>char</code> Strings and string methods
5	23 §§7.1–7.2 Assignment, increment Accumulation	24 §6.3, Lab 4 Strings and vectors	25 §§7.3.1–7.3.2 Sum/average Counting things	[prof absent no class]
October				
6	30 §7.3.3–8.1 Min/max const, constexpr <code>.push_back</code> Input loops	1 Lab 5 Standard loops Reading and modifying code	2 ** §8.2–8.3 Loop-and-a-half break while General loops	[prof absent no class]
7	7 §8.4 do More loop practice	8 Lab 6 Loop practice Exam 1 TH out	9 — Exam 1	[Fall Break no class]

* **3 September:** Deadline to add/drop classes (5pm)

** **4 October:** Deadline to elect pass/fail option (5pm)

Wk	M	T	W	F
	October			
8	14 §9.1 Functions and parameters	15 Lab 7 Unit testing Stubs Debugging	16 §9.2 Parameters Return values Find first match Early return	18 §§9.3–9.5 Random numbers Void functions Recursion
9	21 §10.1 Conditionals revisited Boolean variables Boolean functions	22 Lab 8 Writing functions	23 §§10.2–10.3 Boolean operations Truth tables	25 §§10.4–10.5 Complex booleans DeMorgan's Law
10	28 — Test case coverage	29 Lab 9 Boolean logic	30 §11.1 Bundling data struct	November 1 §§11.2–11.3 Struct parameters Struct return values
11	4 §11.4 Vectors of structs	5 Lab 10 UserLogin	6 * §12.1 Functions on vectors Mapping data Producing vectors of structs	8 §12.2 Filtering data
12	11 §12.3 Reference parameters Adding data Removing data	12 Lab 11 Weather statistics	13 §§13.1–13.2 C-style indexed for	15 §13.3 Nested loops Sorting
13	18 §13.4 Vectors of vectors	19 Lab 12 Lijnspeel	[Research Day] no class	22 §§14.1–14.3 newline and tab Formatted output Line input
14	25 §§14.4–14.5 & Sidebar Streams C strings .c_str printf	26 — Lijnspeel cont'd	[Thanksgiving] no class	[Thanksgiving] no class
	December			
15	2 Ch 15 Arrays, pointers Arrays as pointers 2D arrays	3 Lab 13 Shuffle	4 — Modeling and simulation	6 — Modeling and simulation Exam 2 TH out

Exam 2: Wed 11 December, 3–5:30pm

* **6 November:** Deadline to withdraw from a class (5pm)

Policies

You can find several university-wide course policies at <http://www.longwood.edu/academicaffairs/syllabus-statements/> .

Support

This is an introductory course. That means that what is covered is an important basis for other work in the field, *not* that it is supposed to be obvious, or easy. So don't feel bad if something doesn't click right away. Never hesitate to ask me a question; I'll usually at least give you a hint as to where to look next.

You should also make use of your fellow students as resources. While you can't copy each other's work (see the collaboration policy), studying together is a great idea, and asking and answering questions of other students is actively encouraged.

“Office hours”

If I'm in my office and my door is open, that means I'm available for you to drop in and ask questions, and I'm happy to turn on my “office hours” zoom link so you can join me that way instead. At least four hours a week I've designated as 100% hours, i.e. there's a nearly 100% chance I'm available at those times.

But I'm in my office a lot and I'd like to effectively communicate to you when you're most likely to catch me, so if you look at my office schedule on my website or linked from Canvas, you'll also see many hours listed with other percentages like 60% or 40 or 10, as informal estimates of the probability I'll have office hours in that block for drop-in questions. (If you want more certainty, you can always give me advance notice and be extra sure I'll be there at whatever time!)

If you can't catch me in my office, email or Slack is probably your best bet.

Accommodations

If you have any special need that I can accommodate, I'm happy to do so; come speak to me early in the term so we can set things up. If you have a documented disability, you should also contact Longwood's Accessibility Resources Office (Brock Hall, x2391) to discuss some of the support the college can offer you. All such conversations are confidential.

Honor code policy

Above all, I ask and expect that you will conduct yourself with honesty and integrity—and not to ignore the other ten points of the Honor Code, either. Take pride in what you are capable of, and have the humility to give credit where it is due.

The two main forms of academic dishonesty are “cheating” and “plagiarism”. “Cheating” is getting help from someplace you shouldn’t, and “plagiarism” is presenting someone else’s idea as if it’s your own. If you ever find yourself inclined towards either of these, know that there are always other, better options. Persevere! See my website² for some discussion and examples of how to steer clear of these problems, and feel free to come talk to me if you need help finding some of those other options (even if it’s for another course).

Cheating or plagiarism (on any assignment) will normally receive a *minimum* penalty of lowering the *course* grade by a full letter, and may range at my discretion up to an F *in the course*. Cases will also be turned in to the Honor Board. But: I believe in your potential, and I hope that you will, or will grow to, observe this policy not simply to evade punishment but positively as a matter of character.

Attendance and late policy

Attendance is required, and assignments must be turned in on time. That said, if you have a good reason to miss class or hand something in late, I tend to be fairly liberal with extensions if you ask in advance. (Good reasons do include assignments due for other classes.) (And medical and family emergencies are exempted from the “in advance” part, of course. But contact me ASAP.)

Frequent absence will result in a lowered participation grade; habitual absence may in extreme cases result in a failing grade for the class. *Unexcused* late assignments will normally be given a zero.

Inclement weather policy

I don’t plan to cancel class for weather unless the entire college shuts down; and if the campus closes, I’m likely to hold class in some form by zoom instead (check your email). If you are commuting or are otherwise significantly affected by a weather event, use your own best judgement (and remember that zoom is an option); and if you do miss class for this reason (e.g.: power’s out too), contact me as soon as possible to make up missed work.

²<http://cs.longwood.edu/~dblaheta/collab.html>

Early bird policy

Nobody's perfect, and on occasion an assignment gets written a little unclearly (or, once in a while, with an actual error in it). If you catch one and bring it to my attention early, so that I can issue a clarification or correction to the rest of the class, there'll be some extra credit in it for you.

This document was written and prepared without the use of generative AI.