Syllabus
CMSC121: Intro to computer science
Spring 2024

Time:	TR 12:30pm, Rotunda 356
Websites:	`http://cs.longwood.edu/courses/cmsc121`
	`https://longwood.instructure.com/courses/1312467`

> An introduction to computer science for non-specialists. Basic computer architecture and design, storage formats, principles of computer operation, and algorithms. Application software that emphasizes the computer as a tool. 3 credits. FQRC, WI.

Professor:	Don Blaheta
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100% office hours:	Mondays and Wednesdays 3-4pm;
	Fridays 11am–noon and 1–2pm

Overview

Edsger Dijkstra[1] 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 we will also spend much time without computers, working with the idea of computation itself, and discovering what it can do for us. We will study how data is processed (and how computers can help us handle more of it). We will study how information can be represented (and some of the limits imposed by storing it in a computer). And we will study computers themselves, seeing how the hardware is built, from the circuit level on up.

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

Course objectives / Student learning outcomes

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

1. develop and execute algorithms for the processing of mathematical models,

2. explain the utility and limitations of abstract models for studying concrete real-world situations, and

3. compare and evaluate software and hardware systems on their appropriateness for specific tasks.

Core curriculum objectives. In addition to the course-specific objectives above, this course shares the objectives of the core curriculum as a whole. During this course, the successful student will:

5. engage in creative inquiry and cultivate curiosity,

6. develop foundational knowledge and skills in the discipline (e.g. how to communicate, study, read, etc.), and

7. create and deliver written messages appropriate to audience, purpose, and context.

Quantitative reasoning objectives. As a Quantitative Reasoning course in the core curriculum, this course shares the following objectives as well. At the end of this course, the successful student will be able to:

8. formulate a question/issue using appropriate mathematical, algorithmic, and/or statistical terms, and explain the decision process behind the choices made in that formulation;

9. use mathematical, algorithmic, and/or statistical methods to gather and/or analyze data—justification of the methods chosen should be included;

10. determine the reasonableness of an answer and/or evaluate the explanations of data for reasonableness, and understand the limitations behind the methods used in the previous outcome; and

11. interpret the results of a mathematical, algorithmic, and/or statistical analysis, and present the interpretation in a context appropriate for a broader audience.

Faculty objectives

Per section II-O-III-F-3 in the faculty manual, faculty teaching this writing-infused course are expected to:

12. integrate writing opportunities, exercises, and/or assignments with Core outcomes and individual course objectives, so that students may simultaneously master course content and develop and improve their written communication skills;

13. provide explicit instruction to aid student understanding of writing appropriately for audiences in the relevant context or discipline; and

14. provide appropriate and timely peer and/or instructor feedback on student written communication to allow opportunities for students to improve their performance on subsequent assignments.

Textbook and resources

There is no textbook to purchase. Required readings will be linked from the course website.

You need to own or have access to a laptop, on which you can install software, and which you can bring to class at least on the days marked "Laptops" on the calendar. The laptop can be Windows, Mac, or Linux. It must be able to connect to LancerNet (*not* LancerNetVisitor). If you do not have a laptop, see me early in the term to make arrangements.

You will be expected to have a device (your computer, or a phone or tablet) that is capable of recording and playing audio and video, and connecting to a live meeting via Zoom.

You will be expected to have reasonable bandwidth to connect to meetings, work on assignments, and occasionally upload video, *at your home* or wherever you plan to go in the event the campus closes down. If this is likely to be a problem, contact me early to see if we will be able to work around it.

Covid-19 notes

This section is happily much-abridged from the version I wrote in the first year(s) of the pandemic, but cases are up recently and some attention to Covid-19 is still relevant.

Attending class. There are two ways you can attend class: in person, or via Zoom link. Either mode of attendance is sufficient for purposes of evaluating your presence and participation; 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. (Basically: 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, and it's definitely harder to participate fully when remote. 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 have had a Covid-19 exposure, or even just feel a bit sniffly today, you're not required to zoom (and, as noted, we do prefer in-person attendance where possible) but I do encourage you to 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 send an email with instructions as soon as I know I need to do this.

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.

(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.)

Content policies

Reading and homework

Most topics will have a particular reading associated with them. In general: For the first day of the topic, there will be a reading assignment and associated homework. You'll need to do the reading and the homework *before class*; and I'll check it in class. You will get 5 points (of 5) for doing it *even if your answers are wrong*—the attempt matters, and makes our in-class time much more productive. After we've explored the material in class, the next assignment will be to re-try them and practice on others. You'll have another chance to ask questions about this second round, and then I'll give a 5 point, open-notes quiz with similar problems.

Note that if you are absent from class, you will not in general be able to make up the homework check or quiz points later.

Exam structure and the final exam policy

The first two exams in this class are scheduled on the following days:

<div style="text-align:center">

Exam 1   Thu, 29 February
Exam 2   Thu, 18 April

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They will be 120 points each and have the following format:

- At the end of the last class before the exam, I'll give essay questions worth a total of 40 points. You'll bring your answers with you (on paper, either typed or written) to the exam. You can talk about these questions and bounce ideas off other students as you study for the exam, BUT you must write your actual answers yourself, and you must identify who you discussed it with. You'll be able to refer to your notes and the readings while you do these problems. Some use of generative AI will be allowed here, but see the specific policy printed on the exam handout for details.   *Essay questions Collaborative*

- The in-class part of the exam will contain a mix of multiple-choice and short-answer questions worth a total of 80 points. This part is closed-book. You may optionally use a simple four-function calculator on this part of the exam, but all other electronics (phones, graphing calculators, tablets, laptops) must be turned off and put away.   *MC, short-answer Non-collaborative*

The final exam is scheduled at the following time:

<div style="text-align:center">

Wednesday, 1 May   11:30am–2pm

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If you have a good reason to need to take the exam at another time, you must contact me in advance to make arrangements.

The final exam will have a mix of multiple-choice, short-answer, and essay questions (with no separate take-home portion). It will be cumulative, and most of the problems will be very similar to problems you saw on the first two exams, perhaps with different numbers or different answer options. In my own grade spreadsheet, I will assign a subscore to the two parts of the final; if you do better on a part of the final than you did on the corresponding earlier exam, *I will overwrite the earlier score with the new, higher, subscore.* Caveat: this only applies if you actually take the earlier exams. If you skip an exam, the zero will stand.

Grading breakdown

There are roughly 800 points available in this course; your work 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, in class. General engagement will be evaluated in two-week blocks, so you don't need to artificially say a thing every day. Engagement makes up 5% of the course grade.   5%

Reading and homework. Most topics will have readings and homework assignments, described in more detail elsewhere in this syllabus. Homework checks and quizzes collectively make up 20% of the grade.   20%

Research paper. Over the course of the term, you will write a research paper on the impact of computers on some specific area of human endeavour. There will be some intermediate deadlines; the paper will overall be worth 15% of the final grade.   15%

Exams. There will be two midterm exams, each worth 15% of the grade, and a cumulative final, worth 30%.   60%

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	T	R
January		
1		**11**
		—
		Intro
		Algorithms and preciseness
2	**16**	**18** *
	Laptops	**Laptops**
	Procedures	Conditionals Operations, expressions
	(Light-bot)	Order of operations
	Elements of well-specified algorithms	Algorithms with expressions
3	**23**	**25**
	—	**Laptops**
	Spreadsheets	Repetition in spreadsheets
	Exprs referring to cells	
	Parameters (abs cell refs)	
		February
4	**30**	**1**
	Laptops	**Laptops**
	Spreadsheet builtin functions	(Finish tax form example)
	Using IF and conditions	**Paper topic/source list due**
	(tax form)	
5	**6**	**8**
	—	**Laptops**
	Representing text	Manipulating images
	ASCII, 8 bit codes, Unicode	
	Representing images	
	RGB pixels	
6	**13**	**15** **
	—	—
	Place-value notation	Converting 2-10-16
	Binary and hex	Developing algorithms
		Paper 1 due
7	**20**	**22**
	—	—
	Fractional numbers	Negative numbers
	Scientific notation	
	Limitations of floating point	
8	**27**	**29**
	—	—
	Negative numbers, cont'd	**Exam 1**

* **18 January**: Deadline to add/drop classes (5pm)

** **16 February**: Deadline to elect pass/fail option (5pm)

Wk	T		R
	March		
	SPRING BREAK		
9	**12**		**14**
	—		—
	Basics of compression		Lossy vs. lossless compression
	RLE		Sliding window
	Compression ratios		Standard formats
10	**19**		$\begin{bmatrix} \text{Professor out} \\ \textbf{no class} \end{bmatrix}$
	Laptops		
	AND, OR, NOT gates		
	2-input truth tables		
	Simple digital circuits		
	XOR, NOR, NAND		
11	**26**	*	**28**
	Laptops		**Laptops**
	Circuit equivalence		Boolean algebra
	Circuits from truth tables		
	Converting between representations		
	April		
12	**2**		**4**
	Laptops		—
	Reducing boolean expressions		Parts of a computer
	Circuit design and simplification		Evaluating systems
			Paper 2 due
13	$\begin{bmatrix} \text{Symposium day} \\ \textbf{no class} \end{bmatrix}$		**11**
			—
			Error detection
			(parity bits, Luhn)
14	**16**		**18**
	—		—
	Error correction (2D parity)		**Exam 2**
15	**23**		**25**
	Laptops		**Laptops**
	Event-based programming (Scratch)		Using variables
			Writing a simple game
	May		

Final exam: Wed 1 May, 11:30am–2pm

* **27 March**: Deadline to withdraw from a class (5pm)

General 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 a starting point 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.

I figure I have about 9 hours of your time every week on average, including class time as well as reading and homework. 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.

"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 website[2] 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.

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[2]`http://cs.longwood.edu/~dblaheta/collab.html`

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.

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.