University of Vermont | College of Engineering and Mathematical Sciences
Computer Science

CS / CMPE 2210 (A, B) / Computer Organization / 2026 Fall

Compiled: 2026-10-27 14:11

Class meetings:
B (91862): MWF 12:00 PM–12:50 PM, Kalkin 003
A (90211): MWF 01:10 PM–02:00 PM, Kalkin 003

Instructor: Clayton Cafiero
Email: cbcafier@uvm.edu
Office: Innovation E309
Office hours:
M 02:30–03:30 PM, Th 09:30–10:30 AM,
F 09:30–10:30 AM, or by appointment
Website: https://www.uvm.edu/~cbcafier

UTA: Ben Norton

UTA: Grace Cox

Evening help desk: Su–Th, 5:00–7:00 PM (T/W/Th best)
Locations: Su, M, W: Innovation E204; T: Kalkin 002; Th: Votey 307
Dates: Closed during recesses / holidays

Welcome to the course!

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Description (from the SOC)

Introduction to computer system organization including performance, assembly language, machine-level data representation, arithmetic for computers, processor datapath control, memory, and input/output. Includes significant semester project.

Learning objectives (from the SOC)

- Gain exposure to computer history and technology development.
- Be introduced to the integrated circuit fabrication process.
- Understand basic components of modern computer systems.
- Understand fundamental concepts of computer architectures.
- Understand machine-level data representation.
- Gain exposure to arithmetic and logic operations.
- Understand memory hierarchy and addressing.
- Gain exposure to input / output operations.

Textbook (optional)

Plantz, Robert G. (2022) *Introduction to Computer Organization*, ISBN: 978-1718500099. Available in print or ebook at https://nostarch.com/introcomporg.

Each week's instructional material will include readings, lecture, and supplemental reading posted on Brightspace.

Computer

For this course, you should have a reliable computer on which you can write, run, and debug code. Windows ≥ 11 and macOS ≥ 26.0 are supported. If you have a Linux machine, that's fine (lovely in fact), but you're on your own for support (simply on account of the diversity of Linux distros).

Software

You will be writing programs in Python and C, and accordingly you should have a reasonably current version of Python installed on your computer (*e.g.*, Python ≥ 3.12), and a reasonably current C compiler (*e.g.*, GCC ≥ 16, LLVM clang or Apple clang ≥ 16, MSVC ≥ 14). **If you don't meet these requirements, please address them promptly.** If you need help, come to office hours or help desk. Don't delay.

Important websites

- Brightspace, for course materials, announcements, homework submission *etc.*: https://brightspace.uvm.edu.
- Gradescope, for homework submission (TBD): https://www.gradescope.com/.

Correspondence

Please use email for electronic correspondence (and not MS Teams). As I teach multiple courses please indicate the course and section in which you are enrolled in the subject line. Please use your UVM email for all correspondence.

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Weekly schedule of topics (tentative and subject to change):

Week	Topic
1	Introduction; history and overview of organization; semiconductor fabrication
2	First look at fetch-decode-execute
3	Binary representation of integers and binary arithmetic
4	CMOS circuits and logic gates
5	Combinational circuits: adders, multiplexers, encoders and decoders
6	Sequential circuits: latches and flip-flops
7	Review and midterm
8	Datapath
9	Instruction sets and assembly
10	Fetch-decode-execute revisited; pipelining
11	Memory hierarchy and addressing; non-volatile storage
12	Input / output
13	Additional topics TBD
14	Project work; review

Grading:

Weight	Assessment
10.0%	in-class quizzes; 11 @ 1.0% each; drop one
15.0%	active learning / lab; 8 @ 2.5% each; drop two
15.0%	programming homework; 5 @ 3.0% each
20.0%	midterm exam
20.0%	final exam
20.0%	project
100.0%	TOTAL

Assignment of letter grades will be on a conventional scale. Any grade appeal (assignment, quiz, lab, exam, *etc.*) must be directed to your grader within one week of the grade being posted. If grading is done on Gradescope (*e.g.*, for homework), there's a *regrade request* feature which should be used for grade appeals.

Exams

There will be a midterm examination administered in class.

The Office of the Registrar schedules final exam dates.

- B (91862): R 2026-12-17 10:30 AM–01:15 PM, Kalkin 003
- A (90211): T 2026-12-15 01:30 PM–04:15 PM, Kalkin 003

See: https://www.uvm.edu/registrar/final-exams for complete schedule.

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Programming homework

Programming homework is intended to deepen and reinforce your understanding of material presented in the course.

Programming homework may be done individually or in teams of two (absolutely no more than two). Programming homework is submitted via Gradescope. If you work with someone on homework you must make a note of who you collaborated with as part of your submitted work. All students must type up and submit their own work, regardless of collaboration.

Active learning / labs

Active learning will give you an opportunity to engage with course material in a low-stakes, supervised environment. Most active learning exercises will be conducted in small groups (*i.e.,* 3–5 students) Labs may involve pencil-and-paper exercises or team programming.

Quizzes

In most weeks there will be a very brief quiz administered in class. More details will be presented in class.

Final projects

There will be a final project for the course. Details will be presented in class and on Brightspace. Final projects are to be completed in teams of two or three.

Final projects are due on the last Friday of classes (11 December). Late projects will *not* be accepted. Final projects account for 20% of your grade. See additional instructions, guidelines, and suggestions posted on Brightspace.

Academic integrity

The Department of Computer Science enforces UVM's Code of Academic Integrity. Any suspected violation of this policy will be referred immediately to UVM's Center for Student Conduct (https://www.uvm.edu/sconduct). Sanctions for a violation may include a grade of XF in the course. Additional violations can result in dismissal from the university. In a word: *Don't*. All students should read and understand this policy. See: https://go.uvm.edu/cai.

Collaboration on quizzes and exams is strictly prohibited. Use of online services as a source of solutions is strictly prohibited. Using generative AI such as ChatGPT or Claude, or websites such as Chegg or Course Hero to complete coursework is a form of academic dishonesty. Work you submit for an individual grade must be your own. Any work not produced by you must be cited. For certain assignments, students may collaborate on homework (typically limited to teams of two). If you collaborate with another student on an assignment, be sure to indicate team members as specified. If you have any questions ask!

Any attempt to tamper with or defeat any autograder is a form of academic dishonesty. This applies wherever autograders are in use, for example on Brightspace or Gradescope.

All code submitted by students is subject to code similarity review.

Exams, quizzes, homework assignments, answer keys and solutions, presentations or lecture notes, specifications and rubrics are copyright protected works, unless clearly and explicitly indicated otherwise. Any

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unauthorized copying or distribution of protected works is a violation of federal law and may result in disciplinary action. This includes submission of protected works as prompts to generative AI. Sharing of course materials without the specific, express approval of the instructor may be a violation of the University's Code of Academic Integrity and an act of academic dishonesty, which could result in disciplinary action. Violations will be handled under UVM's Intellectual Property Policy and Code of Academic Integrity, as appropriate. See: https://go.uvm.edu/ipp and https://go.uvm.edu/cai.

Policy regarding use of AI

Here AI is understood to mean any generative AI, which includes but is not limited to ChatGPT, Claude, Copilot, Llama, DeepSeek, Gemini, Kimi, *etc.* It also includes AI summaries in web search results, and tools such as Cursor, Windsurf, Replit, Codex, ZenCoder, *etc.*, and personal intelligence assistants such as Siri / Apple Intelligence, Alexa, Perplexity, and others.

1. **Exams and in-class assessments**. Use of AI is *strictly prohibited* as a means of researching, producing, or verifying answers in exams, quizzes, and other in-class assessments. Any use of AI in such assessments will result in immediate referral to the Center for Student Conduct. *No exceptions*.

Why? Exams and in-class assessments are intended to assess your knowledge and ability to apply concepts you've learned in class. These are not intended to assess your ability to use AI to produce answers. Moreover, should one student use AI and not another, the student using AI might gain an unfair advantage over others.

2. **In-class discussions**. Use of AI is prohibited for use in in-class discussions, unless explicitly permitted by the instructor at a specific time. If you are found to be using unsanctioned AI in an in-class discussion, you will be asked to stop, and you'll receive a zero for participation if the discussion is included in grading. A second infraction will result in referral to the Center for Student Conduct.

Why? In-class discussions are opportunities to ask questions and share your ideas with classmates and the instructor. We're interested in what *you* think, not what a chatbot says. Moreover, studies have shown that use of AI in such contexts can result in a reduced diversity of opinions expressed. Some participation is included in grading, and so, again use of AI can give a student an unfair advantage over others.

3. **Homework**. Use of AI is *strictly prohibited except where noted* as a means of researching, producing, or verifying answers or responses in homework *except where homework specifically calls for the use of AI*. As you are no doubt aware, this is difficult to enforce. Nevertheless, you should not use AI for assistance in homework. *You should be able to read, understand, and explain in detail any other work product you may submit for grading. Do not submit anything you don't completely understand.* Moreover, should one student use AI and not another, the student using AI might gain an unfair advantage over others. If I have questions about how your work was produced I reserve the right to have you come to a meeting in which you give an account of your work and how it was produced. In such a meeting, you should be able to answer questions without hesitation. If I determine that AI was used to produce homework, in whole or in part, I will refer the case to the Center for Student Conduct.

Why? Homework is an opportunity for you to engage deeply with course materials and concepts, and it is meant to provide you with challenges. It is through these challenges that we learn and cultivate our reasoning and problem solving skills. Without human effort, you reduce homework to producing a mere artifact. That is not at all the objective—education is not about producing artifacts, it's about *learning*. You will retain more if you fully engage in problem solving and analysis. What's important is what goes into producing the work—What do you know? How can you apply what you know? How can you strengthen your problem solving skills?

What are the exceptions? Some homework and projects may require the use of AI. Such cases will be clearly indicated, and guidelines for permitted and prohibited use will be supplied in the assignment specification and rubric.

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While the use of generative AI for *producing* prose—reflections, essays, or similar writing—is prohibited, it is permissible to use AI as a proofreader for writing you have produced. UVM has a site license for Copilot, which is integrated into UVM-supplied instances of Microsoft Word. This is very much preferred to outside, third-party tools. If you do use something other than UVM's Copilot instance you must make a note of it in a comment, footnote, or end note. Preserve your voice—make sure your words are indeed your own.

If you have a documented disability (*e.g.*, dysgraphia) or English is not your native tongue and this presents significant difficulty in writing, please contact me about an accommodation.

4. **Autocomplete in application software and IDEs**. What about the role of autocomplete? I recommend turning it off.

Why? In many contexts, *autocomplete defeats its own purpose*. Rather than assisting, it can add to the cognitive load required to complete a task. Rather than just writing the sentence or line of code we had in mind, we may be faced with the challenge of evaluating autocomplete suggestions—which can be a great way to get sidetracked. Some autocomplete features offer multiple suggestions which only compounds the difficulty.

Furthermore, recent studies have shown that in writing autocomplete can subtly steer our thinking and effectively put words in our mouths. This is of concern in light of the fact that the companies which develop and deploy these tools have agendas of their own, and autocomplete can be an insidious way to alter people's views.

That said, this is only a recommendation. Nevertheless, please pay attention to any cognitive burden that autocomplete may cause, and do everything you can to preserve your own voice in writing.

5. **AI as an explainer of things**. It may be the case that you find certain course content confusing or challenging, and there are some legitimate ways one might use AI to explain concepts, provide additional problem instances for practice or limited coaching on various topics. We refer to the beneficial aspects of this use as *cognitive augmentation*. It's OK to use AI in this way, so long as it is of real benefit to the learner (you).

However, there's a problem here. If students use AI in this way, it circumvents the usual avenues for getting help—office hours with an instructor or a teaching assistant. By going directly to AI for help, instructors lose valuable feedback. For instance, if many students ask for help on a specific topic then the instructor is made aware that some students need help. This can provoke questions and actions on the part of the instructor: Maybe I need to explain X (whatever X is) in a different way. Maybe we need to add some think-pair-share exercises or other check-in in class. Maybe I need to spend an extra day on topic X. By going straight to AI, the challenges students face become invisible to the instructor (until exam time, and then it's too late). Another problem is that AI advice may not be aligned with actual course content and learning objectives. But unlike office hours, AI is available 24/7/365.

Accordingly, here's the policy on such assistance. I will make an *anonymized open drop box* available for information students wish to share in this context. This could include information on topics you used AI to explain, actual prompts, or even entire transcripts of chat sessions. These will be anonymous and ungraded, but it might help bridge the gap between students' need for additional explanation and the need for the instructor to receive actionable feedback.

While not AI, the use of Computerphile, 3Blue1Brown, MIT Open Courseware, or other resources for delivery of instructional material also disrupts the feedback loop that instructors need to continuously improve instruction. Therefore, I encourage you to submit links to Computerphile, 3Blue1Brown, MIT Open Courseware, or other resources you have found helpful to the anonymized drop box.

6. **Note-taking**. Use of AI for note-taking is prohibited. This includes Otter.ai and other AI transcription and note-taking tools.

Why? Three reasons. First, if you rely on note-taking and transcription tools, you won't remain as attentive in class, and you'll likely remember less than if you had been engaged and took your own notes. Second, these tools consume streaming data and I do not consent to have class recorded or streamed without my express consent. Third, if other students are aware that AI note-taking is being used, they may feel uncomfortable

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asking questions, offering answers to my questions, or expressing their opinion. This would result in less engaging class sessions for all.

7. **Copyrighted material**. Course materials and assignments are copyrighted unless otherwise noted. Even open source materials can be copyrighted. As a matter of policy, please don't copy/paste or upload copyrighted materials to AI tools.

Why? Uploading copyrighted material to AI tools risks legal infringement, violation of terms of service, and loss of intellectual property rights, as many platforms store and use uploaded data to train their models. This practice can lead to proprietary content being reproduced by the AI for other users, constituting potential copyright violation or even violation of an open source license which requires attribution.

8. **Privacy and FERPA**. As we will have group exercises and may have group homework, it's important that you never share identifying information with AI. If you do use AI for proofreading, make sure all names are redacted before sharing any content with AI tools.

Why? Sharing identifying information about any student other than yourself may constitute a violation of FERPA (Family Educational Rights and Privacy Act).

9. **General**. Any unauthorized use of generative AI, or uncited use where permitted, constitutes a violation of UVM's Code of Academic Integrity and Code of Student Conduct. Violations or suspected violations will be referred to the Center for Student Conduct.

Why? This is a matter of UVM policy. See UVM's Code of Academic Integrity and Code of Student Conduct for more.

10. **Instructor responsibilities**. In keeping with the expectations for students, I will be sure to follow best practices in my own work and in any course materials including lecture notes, handouts, worksheets, exams, quizzes, *etc.* I will indicate clearly where and when AI has been used (if at all) in revising, proofreading, fact-checking, or other contexts. I guarantee that I will never use AI to provide feedback to you on any assessments, ever.

Why? This is necessary for transparency, integrity, and pedagogical benefit. Students have a right to know if AI is used in developing any teaching materials. Failure of the instructor to adhere to the same principles that guide these policies would be hypocritical and dishonest.

11. **Right to opt out of AI use**. There are many ethical issues surrounding the use of generative AI. If you are uncomfortable about using generative AI, your views are welcome and respected, and you are in no way obliged to use it.

Explicitly excluded from the above are the models we build or use in class or homework. Engagement with these is essential to achieving course learning objectives and acquiring AI literacy skills.

12. **Questions and comments**. If you have questions about generative AI or this policy, please do not hesitate to ask.

Attendance

The UVM attendance policy is available at https://go.uvm.edu/srr. We hold class sessions for a reason and attendance is not optional. There will be no make-ups for in-class active learning exercises or assessments if you did not attend class without prior notification and approval. For courses that meet M/W/F, you are allowed three unexcused absences. For courses that meet T/Th, you are allowed two unexcused absences. For each unexcused absence over these limits, your final grade will be reduced. If you have more than double the allowed unexcused absences this will result in an automatic F (failure), *i.e.*, more than six for a M/W/F course or more than four for a T/Th course. If you are using your phone during class, I'll assume that it's not for note-taking and that you've checked out and aren't attending for the session. I will give one warning, after

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which if I see you on your phone it will count as an unexcused absence. (Excluded from this policy regarding phones are students with approved accommodations for use of phone as medical monitoring device.)

If you are not able to attend in-person classes please notify me via email as soon as possible. Depending on the nature of your absence, it may be appropriate for you to contact UVM Student Health Services (https://www.uvm.edu/health/SHS), CEMS Student Services (https://www.uvm.edu/cems/student-services), or the Dean's Office for your college. In many cases, these can provide an official request for flexibility on your behalf. While reasonable accommodations will be granted in the event of documented illness or emergencies, you are responsible for making up any work you have missed.

If you miss a class and make a visit to office hours promptly following your absence, I may be favorably inclined to discount your unexcused absence (though this is at my sole discretion).

Class participation

You are expected to be an active participant in class. The more engaged you are, the more you will learn—and the more fun you'll have. This includes being prepared and attentive, responding when called on, participating in group discussion, and asking questions as appropriate. When it comes to asking questions, *please don't be shy!* There's no such thing as a "dumb" or "silly" question. If there's something you don't understand—*ask*! Asking questions helps you understand the material presented in the course. Asking questions is good for your classmates. It's almost certain that if you need clarification on some point, that there's at least one other student in the class with the same question. So help each other out—*ask*! Finally, when you ask a question you help the instructor to do a better job of explaining. If someone explains something, and you still don't quite grasp it, it's not unlikely that the explanation could be improved or clarified.

Late policy / extensions

Each homework assignment has a specific due date / time. You may submit work up to 24 hours after the due date / time, however, late submissions will be penalized 20%. Submissions that are more than 24 hours late will not be accepted unless an extension has been granted. We will consider reasonable requests for extensions when extenuating circumstances arise. (It can't hurt to ask.) However, extensions will not be granted if the request for extension is made within 24 hours of the time an assignment is due, except in the most extraordinary circumstances. So if you wish to request an extension, *do so early*! If an extension is granted, you must submit your work by the agreed-upon extension date.

Student course evaluations

Students are warmly encouraged to complete an evaluation of the course at its conclusion. Evaluations are anonymous and confidential, and the information gained, including constructive criticisms, will be used to improve the course.

Defects / bonus points

As you might expect, we will deduct points on assignments, quizzes, or exams where you've made an error. It's only fair that instructors should be held to a similar standard. Accordingly, bonus points are awarded for reporting and correcting defects in instructor-written course materials.

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- 1.0 points: Material defect. This includes any error whatsoever in code or solutions, or any error in writing that changes materially the sense of what is written. This also includes incorrect due dates for posted assessments.
- Up to 0.5 points: Minor defect. This includes typos, misspellings, or minor errors which do not affect materially the readability or sense of what is written. Determination of points for minor defects is at the instructor's sole discretion.

Due to the unfortunate behavior of some students who have favored the practice of "bonus point mining" over proper study, no student may earn more than three bonus points in this course.

Due to the fact that we are still writing and revising autograders, autograder defects are not fair game for defect bonus points (but by all means, please report, and perhaps we will award a discretionary point here and there).

Bonus points for any given defect are only awarded to the first student (across all sections) who correctly identifies the error *and provides a valid correction*. Bonus points are not available for any materials which are clearly marked as drafts. Bonus points are added to your final grade before assigning letter grades—a point or two may make a big difference. Happy hunting.

The secret word is "houseplant."

Inclusivity and bias

UVM is a place where you should be treated with respect and kindness. We welcome individuals of all ages, backgrounds, beliefs, interests, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All students are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the community. If you ever feel that you have been unfairly treated or judged by an instructor, a mentor, another student, or another member of the community, please let someone know. Your instructors and advisors in the CEMS Office of Student Services are available to discuss any concerns, or you can report an incident of bias through the bias report program (https://go.uvm.edu/brp).

Conduct

Be kind to one another and to yourself. Be respectful of yourself, others, and the institution. Please arrive on time. Please, no food in class. Please, no cell phones in class (except for medical monitoring with approved accommodations; see: attendance policy for more on this). You may use a laptop or tablet, but only for active learning sessions, taking notes, or assistive technologies. Recording or capturing audio or video of class sessions is prohibited. Still photos of whiteboard / chalkboard are OK but discouraged. Please ask first so I can get out of frame.

For other policies on classroom conduct, please see: https://go.uvm.edu/srr and https://go.uvm.edu/csc.

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Accommodations

In keeping with UVM policy, if you have a documented disability and are interested in utilizing ADA accommodations, you should contact Student Accessibility Services (SAS), the office of Disability Services on campus for students. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter.

Contact SAS: A170 Living/Learning Center; +1 802 656 7753; access@uvm.edu; or visit https://www.uvm.edu/access.

If you are entitled to use the Exam Proctoring Center, please book reservations at least four days in advance.

Promoting health and safety

If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (+1 802 656 3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at https://www.uvm.edu/deanofstudents.

Wellbeing resources

- Center for Health and Wellbeing: https://www.uvm.edu/health/services
- Counseling and Psychiatry Services (CAPS): +1 802 656 3340
- Food Insecurity Assistance: https://www.uvm.edu/health/food-insecurity-uvm

Student advocacy

https://www.uvm.edu/deanofstudents/student_advocacy

Your identity at UVM

Students at UVM can specify the first name and pronoun they want used on campus. For information on how to update your preferred name and personal pronouns as well as keeping your legal name private, and UVM policy on lived name and pronouns, see: https://go.uvm.edu/lnpr.

Religious holidays

Students have the right to practice the religion of their choice. In order to receive extensions or excused absences, you should submit via email your documented religious holiday schedule within the first week of the course. Reasonable extensions will be granted where assignment deadlines conflict with religious holidays.

Student athletes

In order to receive extensions or excused absences, you should submit via email appropriate documentation as soon as possible, preferably within the first week of the course. Reasonable extensions will be granted where assignment deadlines conflict with team events or team travel.

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Statement on alcohol and other drugs

We want you to get the most you can out of this course. Therefore, you are expected to familiarize yourself and abide by the University's policies with regard to alcohol, cannabis, tobacco, and other drug use. See: https://go.uvm.edu/actd. Please do everything you can to optimize your learning and to participate fully in this course.

WCAG 2.1 AA-level standards

This document conforms to WCAG 2.1 AA-level accessibility standards as required by UVM policy.

AI usage statement

No AI was used in researching, planning or writing this document.

However, AI (Anthropic Claude Code 2.1 / Sonnet 4.6) was used to review output of accessibility verification tools (veraPDF (https://verapdf.org/) and to make recommendations to address compliance gaps with respect to WCAG 2.1 AA-level accessibility standards. The specific recommendations provided by Claude were:

- enabling LaTeX document metadata tagging in document preamble,
- switching from XeLaTeX to LuaLaTex as compiler, and
- replacing nested tablulars with `p{}` columns in tables.

Class format changes

The University of Vermont reserves the right to make changes in the course offerings, mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

Changes to this document

This document is subject to change. Any such change will be communicated via an announcement on Brightspace. The latest version of the syllabus will always be available on Brightspace.

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